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ABSTRACT

Analyzed are the results from a follow-up of two groups of college students: (1) a sample of 400 students who started 9th grade in 1958 and graduate from high school in 1962, and (2) a sample of 728 students who were in high school from 1959 to 1963. Both samples were limited to those students who had continued on to college. The purposes of this study were to compare high school and college achievement, to determine major fields of study in college, to survey college mathematics courses taken, and to sample the attitudes of students toward UICSM courses and toward mathematics in general. A discussion is included for those variables which have significant correlations (.01) with the following items: DAT scores, sex, age, semesters of high school mathematics, college grades, high school grades, CEEB scores, calculus in high school, attitude comments, college major, and taking college mathematics. (RS)

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RESEARCH REPORT

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No.9

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Robert E. Comley

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UNIVERSITY OF ILLINOIS COMMITTEE ON SCHOOL MATHEMATICS

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University of Illinois Committee on School Mathematics

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U I C S M

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was supported by the
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A Follow-up Study of UICSM Students Who Started Course 1 in 1958 and 1959[1]

1. Background Information

The University of Illinois Committee on School Mathematics (UICSM) was formed in 1951 as a cooperative undertaking by the College of Education, College of Liberal Arts and Sciences, and the College of Engineering. Professor Max Beberman of the College of Education was appointed as director of this mathematics curriculum project and has served in that capacity ever since. A primary objective of UICSM has been to improve the learning of college-preparatory mathematics in high schools, through major changes in the pedagogy and content of this course sequence.

To achieve this goal, eleven units have been written which comprise the work for four years of high school mathematics. These units cover such topics as the real numbers, algebraic manipulation, equations and inequations, graphs, functions and relations, geometry, mathematical induction, sequences, and special functions. (A more complete topical outline may be found in an appendix to UICSM Research Report No. 7: Comley, 1965.) Since 1959 these units have been available for use in all schools wishing to use them. Prior to 1962 the units were published by the University of Illinois Press. In 1962, D. C. Heath and Company began production of the UICSM materials in a series of hardback texts, High School Mathematics, by Beberman and Vaughan, with Course 1 available in September 1964, Course 2 (1965) and Course 3 (1966). Course 4 of High School Mathematics is presently being revised for publication at a later date. An outline of the development of the UICSM materials is given below.

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1 The author wishes to acknowledge the special assistance of Judith Boyle, who handled the questionnaires, and Aniruddh Thaker and James Kraatz in collating the data and the many high schools and colleges who sent us records -- often omitting the customary charge.

DEVELOPMENT OF UICSM MATHEMATICS - (1953-1963)

1953-54	Grade	Chapter	1954-55	Grade	Chapter	1955-56	Course	Unit	1956-57	Course	Unit	1957-58	Course	Unit
						FIRST YEAR								
The Number Line	9	1	The Number Line	9	1	Directed Numbers	I	1	Directed Numbers	I	1	Directed Numbers	I	1
The General Number	9	2	The General Number	9	2									
Equations in One General No.	9	3	Equations in One General No.	9	3	Pronumerals, Generalizations and Algebraic Manipulation	I	2	Pronumerals, Generalizations and Algebraic Manipulation	I	2	Numbers, Numerals, Pronumerals	I	2
The Coordinate Plane	9	4	The Coordinate Plane	9	4									
Angles, Polygons, Circles	9	5	Angles, Polygons, Circles	9	5									
Similar Figures	9	6	Similar Figures	9	6	Equations	I	3	Equations	I	3	Equations	I	3
Principles of Measurement	9	7	Principles of Measurement	9	7									
Measurement of Areas and Volumes	9	8	Measurement of Areas and Volumes	9	8	Graphs and Ordered Pairs	I	4	Graphs and Ordered Pairs	I	4	Graphs and Ordered Pairs	I	4
Indirect Methods of Measurement	9	9	Indirect Methods of Measurement	9	9									
						SECOND YEAR								
			The Natural Number System	10	1	Natural Numbers	II	1						
			Integers and Rational Numbers	10	2									
			Equations in Two Variables	10	3	Number Systems	II	2	Geometry (Page T-F)	II	1	Geometry (Vaughan)	II	1
			Exponents	10	4	Real Numbers and Quadratic Equations	II	3						
			Plane Geometry (Hochschild)	10	5				Sets and Relations	II	2	Sets and Relations	II	2
						Systems of Equations	II	4						
						THIRD YEAR								
						Complex Numbers (Page)	III	1	Geometry (Page T-F)	II	1	**Real Numbers**	III	1
						Equations, Functions, Slope Function	III	2	**Mathematical Induction**	III	1	**Mathematical Induction**	III	1
						Theory of Equations	III	3	Exponents and Logarithms	III	2	**Exponents and Logarithms**	III	2
						FOURTH YEAR								
									Geometry (Page T-F)	II	2	Complex Numbers (Vaughan)	III	2
									The Circular Functions			Circular Functions and Trigonometry	IV	1

COLOR KEY

- Original Unit
- First Revision
- Second Revision
- Third Revision
- Fourth Revision
- Fifth Revision

1958-59	Course	Unit	1959-60	Course	Unit	1960-61	Course	Unit	1961-62	Course	Unit	1962-63	Course	Unit
						FIRST YEAR								
Real Numbers		1	The Arithmetic of Real No's.		1	The Arithmetic of Real No's.		1	The Arithmetic of Real No's.		1	The Arithmetic of Real No's		1
Numbers, Numerals Pronumerals		2	Generalizations and Algebraic Manipulation		2	Generalizations and Algebraic Manipulation		2	Generalizations and Algebraic Manipulation		2	Generalizations and Algebraic Manipulation		2
Equations and Inequations		3	Equations and Inequations		3	Equations and Inequations		3	Equations and Inequations		3	Equations and Inequations		3
Ordered Pairs and Graphs		4	Ordered Pairs and Graphs		4	Ordered Pairs and Graphs		4	Ordered Pairs and Graphs		4	Ordered Pairs and Graphs		4
						SECOND YEAR								
Sets and Relations	II	1	Relations and Functions		5	Relations and Functions		5	Relations and Functions		5	Relations and Functions		5
Geometry	II	2	Geometry		6	Geometry		6	Geometry		6	Geometry		6
						THIRD YEAR								
Mathematical Induction	III	1	Mathematical Induction	III	1	Mathematical Induction	III	1	Mathematical Induction		7	Mathematical Induction		7
									Sequences		8	Sequences		8
Exponents and Logarithms	III	2	Exponents and Logarithms	III	2	Exponents and Logarithms	III	2	Elementary Functions: Powers, Exponentials and Logarithms		9	Elementary Functions: Powers, Exponentials and Logarithms		9
						FOURTH YEAR								
Complex Numbers	III	2	Complex Numbers	III	2	Complex Numbers	III	2	Complex Numbers	III	2	Complex Numbers	III	2
Circular Functions and Trigonometry	IV	1	Circular Functions and Trigonometry	IV	1	Circular Functions and Trigonometry	IV	1	Circular Functions and Trigonometry	IV	1	Circular Functions and Trigonometry	IV	1

1.1 Purpose of the Study

Throughout the period from 1952 through 1958 the number of students using UICSM textbooks for three or more years of study increased at a partially controlled rate through expanded experimental tryouts. In 1959, when the textbooks were released for general use, the number of users increased sharply and it has risen gradually through further textbook sales; however, no comprehensive totals have been determined at this time.

Some (at least partial) test data have been collected for each of approximately 10,000 students who started Unit 1 of the UICSM sequence in 1958 or 1959. These data include aptitude test scores (DAT-V and N, CEEB-V and N). and achievement test scores (Coop Algebra, Coop Geometry, and UICSM-constructed tests). One analysis of algebra achievement as measured by the Coop Algebra test has been carried out by Tatsuoka and Easley (1963). Another report, by Comley (1965), analyses inter-correlations of the previously mentioned variables. Other studies of these students are in progress.

The present report includes results from a follow-up of two groups of college students: (1) A sample of 400 students who started 9th grade in 1958 and graduated from high school in 1962. (2) A sample of 728 students who started 9th grade in 1959 and graduated from high school in 1963. Both samples were limited to those students who had continued on to college. The 1962 graduates have been polled through two questionnaires (1963, 1964), while the 1963 graduates have been sampled by means of a questionnaire which incorporated many items similar to those which were sent to the first group. The purposes of this follow-up study were to compare high school and college achievement, to determine major fields of study in college, to survey college mathematics courses taken, and to sample the attitudes of students toward UICSM courses and toward mathematics in general.

2. The Sample of Students Who Started 9th Grade in 1958*

2.1 Description of the Sample

In 1963 the UICSM mathematics project undertook a follow-up study of students who had completed at least three years of UICSM mathematics courses and were enrolled as full-time students in a college or university during the 1962-63 school year. This sample of 1962 high school graduates was obtained from the first group of high school students to complete (or nearly complete) the current versions of the UICSM mathematics courses. We wrote to all the high schools whose teachers had been trained by UICSM staff members in the courses they taught, and asked for lists of graduates. Returns from these high schools amounted to about 50% of the mailing.

A total of 560 of the 1962 graduates were contacted, and 417 completed and returned the questionnaire at the end of their first college year - a very encouraging 74% return. Of these 417, only 17 students had to be eliminated from the sample because of incomplete data, so that the final sample contained 400 students – 221 boys and 179 girls, from 168 colleges and universities in 36 states. The mean age of the students in the sample was 18.3 years with the distribution of ages as given in Table 1. Among the 400 students who provided complete data, 379 gave

Table 1. Age distribution of students in this sample.

Age	16	17	18	19	20	Σ
n	1	25	244	129	1	400
%	0.3	6.3	61.0	32.3	0.3	100.2

*The initial analysis of the data for this 1958 sample was carried out by Judith Boyle, and was included in a preliminary report published in 1963.

us permission to obtain their high school records and college transcripts. The high schools and colleges involved in this study were very cooperative in providing transcripts – often at no charge – for which we are most grateful.

2.2 The questionnaires that were sent to the 1958 sample of students in 1963 and in 1964.

The first questionnaire to the 1958 sample (1962 graduates) was sent out in the Spring of 1963. A copy of this questionnaire has been included as Appendix A. Information was sought concerning high school mathematics courses and achievement, college mathematics courses and gradepoint averages, and probable major fields of study in college.

The second questionnaire, sent out in Spring of 1964, dealt mainly with attitudes which UICSM students held with respect to their UICSM courses, teachers, college mathematics courses, and the proper emphasis on theory and application in mathematics instruction. This questionnaire is included as Appendix B.

2.3 Discussion of findings.

Table 2 summarizes data, from the first questionnaire sent to the 1962 graduates, concerning the students' high school training and grades.

Table 2

High School Training and Gradepoints*

	N	Mean	S.D.
Semesters of High School Math	379	7.8	.73
Semesters of UICSM Math	379	7.1	†
Semesters of High School Science	379	6.1	†
High School Math gp	379	4.1	.70
High School gp	379	4.1	.49
CEEB-V	203	569.9	93.7
CEEB-N	203	608.6	89.9

*Gradepoint Scale: A = 5.0, B = 4.0, C = 3.0, D = 2.0, E = 1.0

†Were not computed.

Also given are means of the CEEB-V and CEEB-N scores that were reported for this sample. These may be compared with some data, from College Board Score Reports (1960, p42), which are given in the following table.

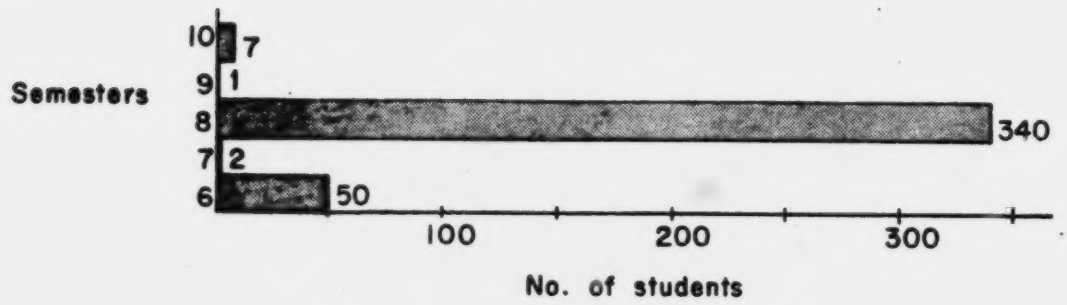
Table 3 Percentile ranks of secondary school seniors who took the SAT.

	Boys		Girls	
Scores	Verbal	Mathematical	Verbal	Mathematical
800		99+		
750	99+	98	99+	99+
700	98	94	98	99
650	93	85	93	96
600	85	72	84	89
550	73	58	71	79
500	58	41	56	64
450	41	26	38	46
400	26	14	22	27
350	12	5	10	12
300	4	1	4	3
250	1		1	
200				
Average score	479	527	486	467

The CEEB-V mean of 569.9 (boys and girls) is higher than the 71st percentile for girls and the 73rd percentile for boys; while the CEEB-N mean of 608.6 is above the 72nd percentile for boys and the 89th percentile for girls. CEEB, through statistical adjustments, provides for the stability of SAT scores from year to year so that these scores given in the 1960 report and those of UICSM students in 1962 may properly be compared. It seems evident that this sample of UICSM students for which CEEB scores were reported is a better-than-average group of students.

Drop out rate for students in UICSM courses is of interest to us. Some indication of drop out rate in the 12th grade is given by Figure 1.

Figure 1. Number of semesters of mathematics taken by the UICSM students in this sample.



It may be noted that all 400 students took at least 6 semesters of UICSM and that 52 students took less than 8 semesters, which may be interpreted as a 13% drop out for this sample in the senior year. The fact that 7 students studied UICSM for 10 semesters is the result of their starting Course 1 in the 8th grade. The odd numbers of semesters indicate mid-year dropouts. It is planned to make further determinations of drop-rates through future studies.

The question is often asked concerning the effects of curriculum changes on students. College grade-point averages and major field choices may be used as partial indication of these effects. In Table 4, it can be seen that nearly 30% of the sample chose mathematics, engineering, or a physical science as a probable major. The grade-point means indicate better-than-average achievement by these students.

Table 4

College Grade-point Averages and Major Fields of Study

	N	Mean	S.D.
College gp average	379	3.7	.65
College Math gp average	261	3.8	.98

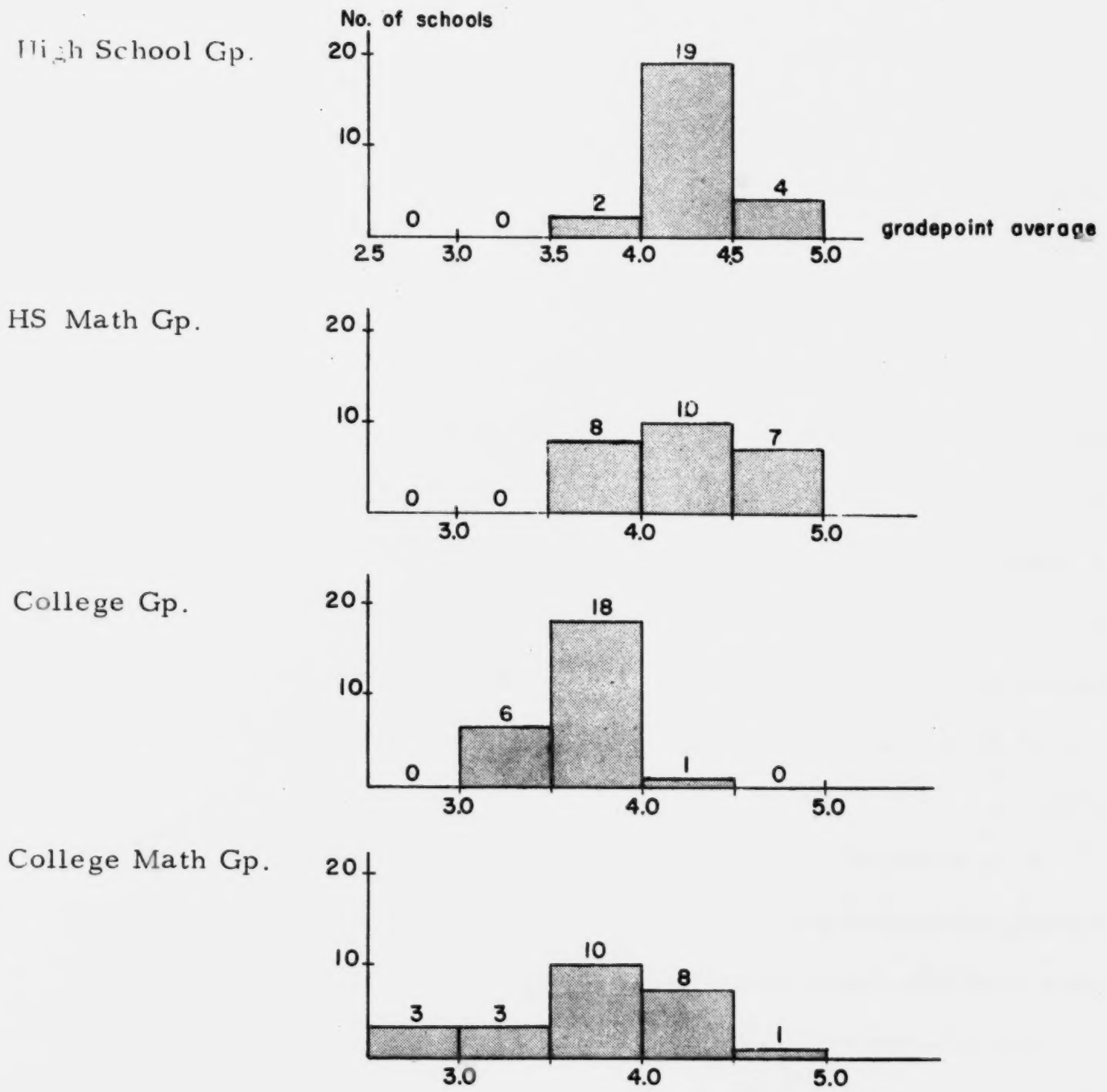
				Project Talent		
Probable Major Field	%		N	%		
Mathematics	12.3	29.4%	49	4.4	18.0%	
Engineering	8.3		33	117	9.4	
A Physical Science	8.8		35		4.2	
Other	60.8		243		81.9	
Undecided	10.0		40			
Total	100.2		400		99.9	

The corresponding percentages for choices of probable major field in college is compared in Table 4 with the expected major fields of study of the Project Talent (1964) sample, which is a larger and more diversified group. The number of major field choices presented by the Project Talent questionnaire was more extensive than that of the UICSM questionnaire so that, apparently, most Project Talent students found some field interesting enough to check as a major and virtually no students were left for an undecided category.

It is interesting to note that larger percentages of the UICSM students chose mathematics and physical science, while a larger percentage of Project Talent students chose engineering as a probable field of specialization.

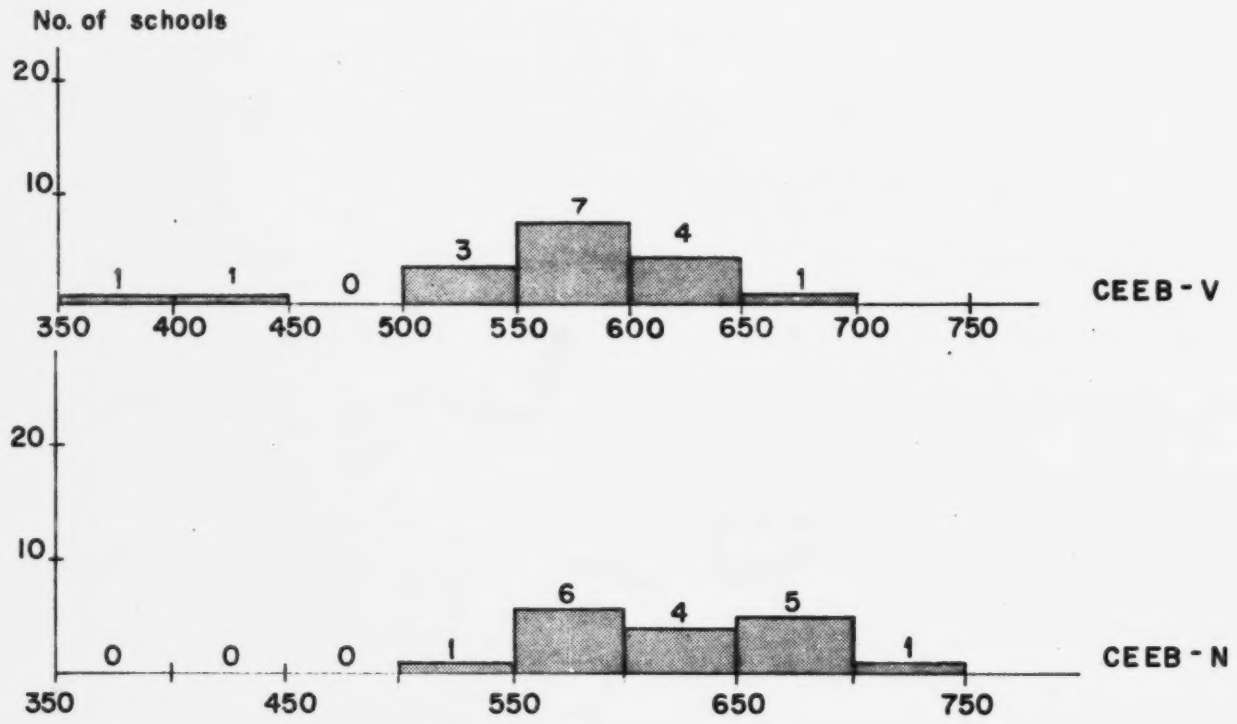
Distributions of mean scores for grade-point averages and CEEB scores of the groups of students from the 25 high schools involved in the follow-up study are given in Figures 2 and 3. Figure 4 represents the distribution of high school mathematics grade-point averages for the 400 students in the 1962 sample.

Figure 2. Some distributions of mean scores, for grade-point averages, of the student groups from the 25 high schools.



(A = 5, B = 4, C = 3, D = 2, E = 1)

Figure 3. Distributions of means, for CEEB scores, of groups of UICSM students from 17 of the 25 high schools in this study.*



*CEEB scores were available only for students from 17 of the 25 schools.

Figure 4. The distribution of high school mathematics grade point averages for the 400 UICSM students in the sample of 1962 high school graduates.

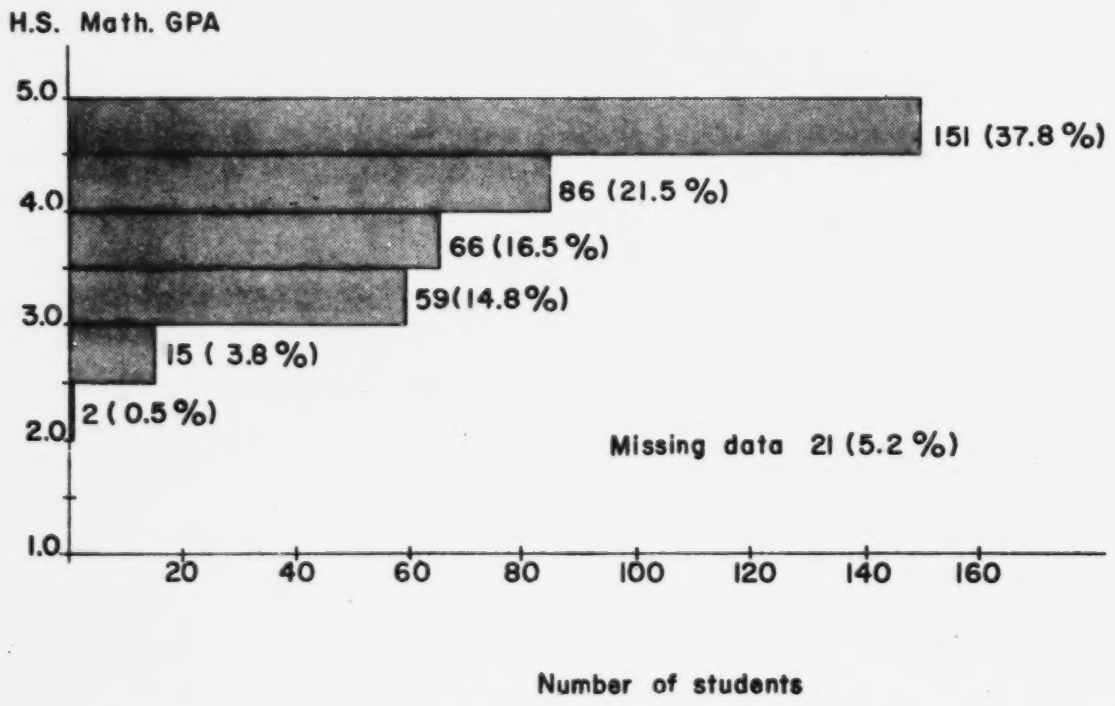


Figure 2 indicates that the high schools represented in the sample were fairly uniform with respect to overall high school grade-point averages of their UICSM students; however, there was greater variation among the high schools with respect to mathematics grade-point averages. Both sets of these averages, High School Gp and High School Math Gp, accumulated toward the higher end of the grade-point scale. Similar statements hold for college averages except that there was a shift downward (compared to high school grade-points) along the grade-point scale which resulted in a mean of about 3.8 for these students. This overall downward shift might be expected for the first year of college work.

From Figure 3 it may be noted that <u>for every</u> school, the average CEEB-N score of UICSM students in this sample was at least 500. The school with the highest mean had a mean score of 713.

Figure 4 reiterates findings of Table 2 and Figure 2 but in terms of number of students as a dimension. It is clear that these UICSM students received grades, in their mathematics courses, which tended toward the upper end of the grade-point scale.

Because of considerable interest in the articulation of UICSM – and college mathematics courses, the UICSM students were asked to list the first mathematics courses that were taken in their college careers. From Table 5 it can be seen that 41.3% of the 400 students in this sample enrolled in analytic geometry, calculus, or a more advanced course as their first college math course – or, to make a different comparison, 165 students (61.3%) out of the 269 students who took math courses.

Table 5

College Mathematics Courses and Grades

	No. Taking as First Math Course	%	Number Taking Course*	No. for Whom Grades Were Available	Mean gp†
Math Courses Taken					
Freshman Math	54	13.5	54	53	4.0
College Algebra	22	5.5	22	18	3.8
Algebra and Trig.	23	5.8	30	28	3.4
Trig.	5	1.3	14	12	3.8
Analytic Geom.	42	10.5	56	54	3.8
Calculus	118	29.5	171	168	3.7
Other	5	1.3	37	36	4.0
Total	269	61.4	384	369	
No College Math Taken	131	32.8			
Total	400	100.2			

* Some students took as many as three mathematics courses in their freshman year.

† On this scale: A = 5, B = 4, C = 3, D = 2, E = 1.

The students were asked to comment on the mathematics training they had received in high school. What each student wrote in response to this request was broken down into separate comments and these were classified into general comment types. Table 6 lists the comment types which were found in at least 5% of the student's responses, and the number of students making each type of response. Also listed are all suggestions made by at least 5% of the students.

Table 6

Comments made by at least 5% of the 400 students

Favorable Comment Types	Frequency of Comments
Glad to have had the UICSM program	81
Teachers were excellent/well-trained/helpful	78
UICSM gave me a basically sound mathematics program	77
UICSM gave me an advantage over others in college	69
UICSM taught me to think clearly and logically	44
UICSM gave me an interest and desire to learn	36
UICSM has helped me in solving problems of all kinds	36
The basic concepts and skills taught have been especially helpful	34
More was learned than could have been in any other program	30
UICSM stands out from my high school training	28
The self-discovery method is especially helpful	27
UICSM gave me a questioning attitude	25
UICSM is a thinking course	21
Misc. favorable comments (less than 5% each)	168
	754
Unfavorable Comment Types	
Teachers were confusing/not well-trained/not helpful	40
I had difficulty making transition to other methods	37
A traditional program would have been more beneficial	23
UICSM left me behind others in college	21
My interest in math was stifled by UICSM	20
UICSM is only for above-average students	20
Misc. unfavorable comments (less than 5% each)	144
	305
Suggestions	
Calculus should be included in the program	36
More emphasis needed on practical applications and manipulation needed	35
UICSM should begin in lower grades	31
Trigonometry should be stressed more	24
Misc. suggestions (less than 5% each)	138
	264

It may be noted from Table 6 that more than twice as many (754) favorable comments were made than unfavorable comments (305) by these students. This summary, in itself, does not clearly demonstrate a general liking or disliking of the UICSM courses by this sample of students. It may have been the case that a small number of students listed a large number of favorable comments or, contrariwise, that a small number of students listed a large number of unfavorable comments. In order to obtain a more meaningful summary, on a one-man-one-vote basis, the set of comments made by each student was rated in terms of its overall expression of an attitude with respect to the UICSM course sequence. Table 7 gives a summary of the students' general attitudes categorized according to the strength of liking or disliking, so that each student is counted only once. It may be noted that 277 students, or almost 70% of this sample, liked UICSM mathematics.

Table 7

Classification	N.	
Moderate to strong liking	219	54.8
Weak to fairly weak liking	58	14.5
Indifferent	31	7.8
Weak to fairly weak disliking	21	5.3
Moderate to strong disliking	55	13.8
No comments	16	4.0
	400	99.9

The question was asked, in the first questionnaire sent to 1962 graduates, concerning particular topics from high school mathematics which the students found most useful. A list of the topics, which were found in 15 or more responses, is given in Table 8.

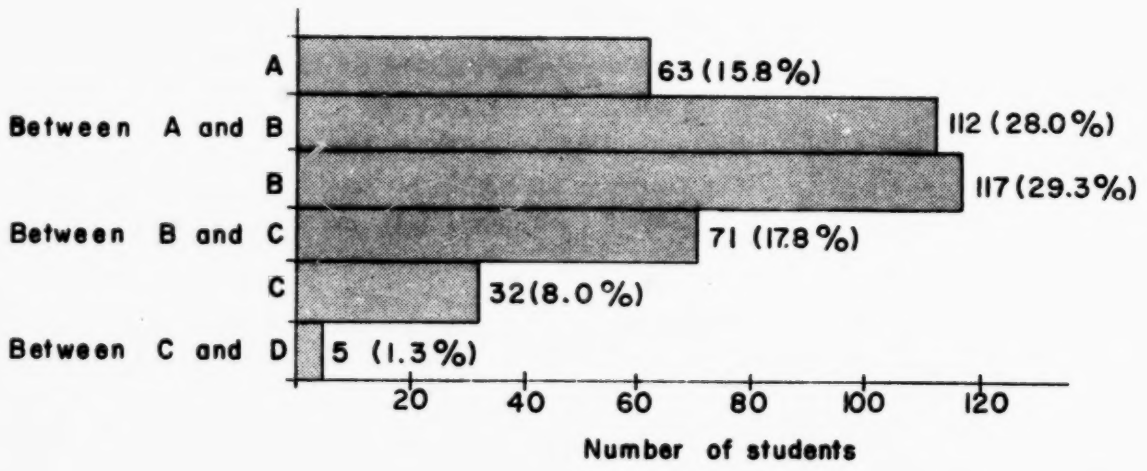
Table 8. Important-topic responses (Question XXI) which appeared 15 or more times in answers given by 1962 high school graduates on the first questionnaire sent to this group.

TOPIC	NUMBER
Scientific Notation	111
Trig Identities	81
Logarithms	65
Induction	54
Circular Functions	49
Solving Inequalities	49
Quadratic Equations and Formula	48
Graphing	44
Basic (Fundamentals) Principles (Generalizations)	42
Exponents	30
Geometric Formulas and Theorems	27
Sequences and Summations	25
Set Theory	23
Logic	23
Trig Formulas (sine law, cosine law, etc.)	23
Trigonometry	22
Simultaneous Equations	22
Complex Numbers	21
Geometric Functions	21
Set Notation	20
Differentiation	20
Equations	20
Geometry	18
Integration	18
Ordered Pairs	17
Linear Equations	16
Algebra	16
Functions	15
Slope Equations	15
Relations	15
Analytic Geometry	15
Totals 31 topics	985

The topics "Scientific Notation" (111), "Trig Identities" (81), and "Solving Inequalities" (49) were given as sample topics for this item in the questionnaire. It is unknown how much suggestive effect this listing had on the students' recordings of important topics in their responses. Subject matters that were mentioned in student responses less than 15 times have not been included in this report, so that this list represents only a partial (albeit best recalled) set of important topics.

Another item of interest which was sampled in this questionnaire study was that of overall achievement by UICSM students in high school science courses. A distribution of overall science grade averages is given in Figure 5.

Figure 5. Distribution of overall grade averages achieved by 400 UICSM students in high school science courses.



Referring back to Table 2, it can be seen that the average student took about six semesters (or 3 years) of science courses in high school. The science grade-point averages for this group of students seems to be shifted from a normal curve slightly toward the A-B end of the scale.

Conditions which were statistically significant at the 1% level.

The question may be asked concerning relationships that exist among aptitude, sex, age, achievement, and attitudes for UICSM students in this sample. Table 9 shows the correlations obtained among the variables included in the questionnaire and data obtained from the high schools. The correlation coefficient for any pair of variables appears at the top of each cell and the number of students for whom data was available on both of those variables appears at the bottom of each cell.

On the following pages, we shall briefly discuss each variable and how it relates to the other variables. Only correlations which are significant at the 1% level are discussed here.

Table 9

Correlation Table Sample of 1962 H.S. Graduates Follow-up Study*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 DAT-V	—	.38 267	.04 267	.05 267	.10 267	.20 256	.10 176	.36 255	.34 255	.58 113	.47 113	.14 266	-.04 262	-.02 247	-.03 267
2 DAT-N		—	-.05 269	.03 269	.13 269	.30 258	.23 178	.42 257	.56 256	.23 113	.43 113	.17 268	.14 264	.15 248	.18 269
3 Sex 1-Male 2-Female			—	.04 399	-.23 399	.09 378	.04 259	-.17 377	.04 377	-.15 203	-.38 203	-.06 398	-.06 389	-.29 359	-.24 399
4 Age				—	-.07 399	-.14 378	-.11 259	.00 377	-.08 377	-.21 203	-.23 203	-.09 398	.05 389	-.08 359	-.01 399
5 Semesters of H.S. Math					—	.03 378	-.01 259	.03 377	.23 377	.14 203	.36 203	.19 398	.27 389	.23 359	.23 399
6 College gp						—	.74 259	.49 377	.44 377	.17 203	.24 203	.09 377	.15 372	.13 339	.08 378
7 College Math gp							—	.35 258	.36 258	-.04 133	.19 133	.16 259	.23 254	.21 232	.10 259
8 High School gp								—	.82 377	.42 203	.47 203	.12 376	.21 371	.02 338	.09 377
9 High School Math gp									—	.38 203	.62 203	.24 376	.32 371	.20 338	.22 377
10 CEEB-V										—	.60 203	.25 203	.00 199	.06 177	.12 203
11 CEEB-N											—	.40 203	.20 199	.40 177	.31 203
12 Calculus in H.S. 1-Yes 0-No												—	.13 388	.16 358	.09 398
13 Summary Comment (on a like-dislike scale from 9 to 0)													—	.23 351	.22 389
14 Majors 1-(Math, Sci., or Engineering) 0-(Other)														—	.34 359
15 College Math 1-Yes 0-No															—

*The correlation coefficients in the shaded cells are significant at the 1% level.

I. DAT Scores

A. DAT-Verbal

The following variables correlate significantly with the DAT-V score.

1. Positive correlations: DAT-N, Cgp, HSgp, CEEB-N

2. Negative correlations: None

B. DAT-Numerical

The following variables correlate significantly with the DAT-N score

1. Positive correlations: DAT-V, Cgp, CMgp HSgp, HSMgp, CEEB-N, calculus in HS, and taking college mathematics

2. Negative correlations: None

The higher the DAT scores, the higher seem to be the CEEB scores and grade-point averages. Those who made the higher scores on DAT-N tended more to have studied calculus in high school, and to have taken mathematics in college.

II. Sex (Data coding: Male 1, Female 2)

The following variables correlate significantly with sex.

1. Positive correlations: HSgp

2. Negative correlations: Semesters of HS mathematics, CEEB-N, majoring in a scientific field, and taking college mathematics

The girls had significantly higher high school grade-point averages. The boys took more mathematics in high school, did better on the CEEB-N test, tended more often to major in mathematics, science, or engineering in college, and took more mathematics courses in college.

III. Age

The variables that are negatively and significantly correlated with age indicate that the younger students in this sample tended to have higher college averages and higher CEEB scores. Although age differences were not great (i.e. 93% of the students were either 18 (61%) or 19 (32%) year old at the end of their freshman year in college), these correlations may offer further evidence toward the advisability of de-emphasizing age as a criterion for progress through elementary – and secondary curricula. Only 3 out of the 14 other variables correlated significantly with age, the remaining 11 correlations being not significantly different from zero.

IV. Semesters of High School Mathematics

The following variables correlate significantly with the number of semesters of high school mathematics at the .01 level.

1. Positive correlations: HSMgp, CEEB-N, calculus in HS, favorable summary comments, majoring in a scientific field, taking college mathematics
2. Negative correlations: Sex

We note that those students with the greater number of semesters of high school mathematics tended to have higher grades in high school mathematics and higher CEEB-N scores. Also, those students took more calculus in high school, were more favorable in their opinions about their high school mathematics training, took more mathematics in college, and tended more often to major in mathematics, science, or engineering. The negative correlation with sex here indicates that the boys took more math in high school than did the girls.

V. College Grades

A. Overall grade-point average (Cgp)

The following variables correlate significantly with Cgp at the .01 level.

1. Positive correlations: DAT-V, DAT-N, CMgp, HSgp, HSMgp, CEEB-N, favorable summary comments

2. Negative correlations: Age

B. Mathematics grade-point average (CMgp)

The following variables correlate significantly with CMgp at the .01 level.

1. Positive correlations: DAT-N, Cgp, HSgp, HSMgp, favorable summary comments, majoring in a scientific field

2. Negative correlations: None

The higher the grades in high school, the higher seem to be the grades in college. Those with high overall college grade points also had higher than average scores on the DAT and CEEB tests. Those with the higher college mathematics grades tended to major in mathematics, science, or engineering in college. The students who had the higher Cgp or CMgp were favorable in their comments about their high school mathematics training.

VI. High School Grades

A. Overall grade-point average (HSgp)

The following variables correlate significantly with HSgp at the .01 level.

1. Positive correlations: DAT-V, DAT-N, Sex, Cgp, CMgp, HSMgp, CEEB-V, CEEB-N, favorable summary comments

2. Negative correlations: None

B. Mathematics grade-point average (HSMgp)

The following variables correlate significantly with HSMgp at the .01 level.

1. Positive correlations: DAT-V, DAT-N, semesters of high school mathematics, Cgp, CMgp, HSgp, CEEB-V, CEEB-N, calculus in high school, favorable summary comments, majoring in a scientific field, taking college mathematics

2. Negative correlations: None

We note from the correlations listed above that the students with the higher overall high school grades were those students with the higher high-school-mathematics grades. These students also had higher college grades and higher scores on the DAT and CEEB tests, made more favorable comments about their high school mathematics training, and praised their high school mathematics teachers. Further, the students with the higher mathematics grades in high school were those who took more semesters of mathematics in high school, studied calculus in high school, took mathematics in college and tended more to major in mathematics, science, or engineering in college. The High School Math gp variable correlated significantly at the 1% level with all of the other variables except sex and age.

VII. CEEB Scores

A. CEEB-V

The following variables correlate significantly with the CEEB-V at the .01 level.

1. Positive correlations: DAT-V, HSgp, HSMgp, CEEB-N, calculus in high school

2. Negative correlations: Age

B. CEEB-N

The following variables correlate significantly with the CEEB-N at the .01 level.

1. Positive correlations: DAT-V, DAT-N, semesters of high school mathematics, Cgp,

HSgp, HSMgp, CEEB-V, calculus in high school, favorable summary comments, majoring in a scientific field, taking college mathematics

2. Negative correlations: Age, Sex

Students with the higher scores on the CEEB-V also have the higher scores on the DAT-V, the CEEB-N, and made higher grades in high school. These were the students who took calculus in high school. Students with the higher scores on the CEEB-N also fit the description above, but they also had the higher scores on the DAT-N, took more mathematics in high school and in college, tended more to major in mathematics, science, or engineering in college, and were more favorable in their comments about their high school mathematics training. It is interesting to note that the CEEB-N scores correlated significantly at the 1% level with all variables except College Math gp.

VIII. Calculus in High School

This variable correlates at the .01 level with the following variables.

1. Positive correlations: DAT-N, semesters of HS mathematics, HSMgp, CEEB-V, CEEB-N, favorable summary comments, majoring in a scientific field

2. Negative correlations: None

That is, the students who studied calculus in high school were those who made the higher scores on the DAT-N and the CEEB tests, made higher grades in mathematics in high school, took more mathematics in high school, tended more to major in mathematics, science, or engineering in college, and were more favorable in their comments about their high school mathematics training.

IX. Summary Comments

This variable correlates significantly at the .01 level with the following variables.

1. Positive correlations: Semesters of high school mathematics, Cgp, CMgp, HSgp, HSMgp, CEEB-N, calculus in high school, majoring in a scientific field, taking college mathematics

2. Negative correlations: None

We note here that the more favorable comments made about high school mathematics training were from the students who had the higher grades in both high school and college. These students also did better on the CEEB-N test, studied more mathematics in high school including calculus, studied more mathematics in college and tended to choose a major in mathematics, science, or engineering in college.

X. Majors

The following variables correlate significantly at the .01 level with choice of college major.

1. Positive correlation: semesters of high school mathematics, CMgp, HSMgp, CEEB-N, calculus in HS, favorable summary comments, taking college mathematics

2. Negative correlations: Sex

The students who planned to major in mathematics, science, or engineering were those who studied more mathematics in high school and college, had the higher grades in mathematics in both high school and college as well as the higher scores on the CEEB-N test. These students also were more favorable in their comments about their high school mathematics training and less critical of their high school mathematics teachers.

The negative correlation with sex indicates that more boys than girls tended to major in mathematics, science, or engineering.

XI. College Mathematics

The following variables correlate significantly at the .01 level with the taking of college mathematics.

1. Positive correlations: DAT-N, semesters of high school mathematics, HSMgp, CEEB-N, favorable summary comments, majoring in a scientific field

2. Negative correlations: Sex (Data coding: Male 1, Female 2)

Those students who took mathematics in college had higher scores on the DAT-N and the CEEB-N, they had taken more mathematics in high school and received higher grades in high school mathematics;

they tended to major in mathematics, science or engineering in college, and were favorable in their comments about their high school mathematics teachers and training. More boys than girls took mathematics in college.

A note on some statistically non-significant correlations

It is interesting to note that the correlation between DAT-N and sex is almost zero, i.e. $r = -.05$, which indicates that girls in this sample have a distribution mean of numerical aptitude scores approximately equal to the distribution mean for boys in this sample. It may also be noted that the correlation coefficient of sex with high school math grade point average is $r = 0.04$. However, if one looks at the correlation coefficient of sex with semesters of high school mathematics, it is found that $r = -0.23$ which is significant at the 1% level and indicates that boys take more mathematics than girls. The combination of these three correlation coefficients, among students who do take mathematics, suggests that girls may be mathematically as capable as boys but do not elect to pursue mathematics to the same degree. This may be due to factors of social and cultural expectations or differences in interest patterns but could represent, on a national scale, a large and possibly needless loss of mathematical talent. Any program which utilizes more completely the available potential, should be of interest to workers in the field of mathematics education and to personnel in the

different sciences which use mathematics in varying degrees. Further comments are given on this problem in an article by Peden (1965), who presents a strong case for the increased entrance of talented girls into scientific fields and urges the support of teachers and counselors in this effort.

That such a trend may have already begun is suggested by U.S. Office of Education estimates (see reference 6) of the percent increases in the number of baccalaureate degrees conferred in mathematics in 1962 over the number conferred in 1960. These estimates show a 31% increase for men and a 34% increase for women.

One further summary of data on the first questionnaire was done. The students in this sample were asked to check, or write in, the names of college entrance examinations which they had taken. This list is summarized below with the totals obtained from the questionnaires.

Table 10. College entrance exams taken by UICSM students.

	No. of Testings	%
Scholastic Aptitude Test (SAT)	383	95.8
Writing Sample (WS)	166	41.5
American College Testing Program (ACT)	118	29.5
Intermediate Mathematics Achievement Test	133	33.3
Advanced Mathematics Achievement Test	107	26.8
PSSC Physics Achievement Test	20	5.0
Traditional Physics Achievement Test	24	6.0
Combined Physics Achievement Test	1	0.3
Total	952	
Other	304	(36 different tests)
Grand Total	1256	

The "Other" category included tests in languages, social studies, sciences, history, mathematics, and special local entrance examinations, totaling 36 different listings. It can be seen from the grand total of 1256 that these 400 students each took, on the average, about three college entrance examinations.

It is hoped that more detailed studies of UICSM students relative to their scores on these tests can be done in the future.

Some results from a second questionnaire sent to the 1962 graduates in the spring of 1964.

A second questionnaire was sent, at the end of their sophomore year, to the group of 400 college students who had returned the first questionnaire. These returns totaled 299 of the 400 mailed out, a 74.8% return which duplicated essentially the return rate for the first questionnaire.

The students were asked to list the colleges and universities that they had attended, along with the location and dates of attendance. In addition to providing a list of current college addresses of the respondents, these data provided information concerning mobility of this group as college students. Of the 299 respondents, 256 (85.6%) listed only one institution, 42 (14.0%) listed two, and 1 (0.3%) listed three institutions; so 14.3% of this group had attended more than one college or university by the end of the sophomore year.

In order to get some information on time spent as a student and the variability of college calendars within this group, another question asked for the number of terms of college work which would be completed "at the end of the present term", and allowed for recording semesters, quarters, trimesters, and summer sessions. The distributions of the numbers of terms of study are given in Table 11 for each type of college term. It was noted that some students recorded numbers for more than one type of term, because of having attended two colleges that used different academic calendars.

Table 11. Numbers of terms of study completed by respondents.

	1	2	3	4	5	6	7	8	Totals
semesters	3	13	8	216	2	2	0	1	244
quarters	0	0	6	2	1	27	2	1	39
trimesters	1	5	0	6	1	8			21
								Σ	304*
summer sessions	18	2							20

*Evidently, some of the 299 students reported more than one kind of college term.

It can be seen that the students who had completed two full academic years (4 semesters, 6 quarters, or 4 trimesters) number 249 (83.3%), while 17 students (5.7%) had completed more than two academic years, leaving only 11% of these students who had completed less than two academic years of college in the spring of 1964, two years after graduation from high school. Only 20 (6.7%) of these 299 students had attended summer sessions in college.

There was some interest in knowing about the kinds of mathematics courses these students had taken since the end of their first year in college, which texts were used, the students' reasons for taking the courses, and the grades received. Consequently, a question was included in the questionnaire to elicit this information. A variety of courses were listed, with an even greater variety of texts. A summary of these findings is included below in Table 12.

Table 12. Data related to mathematics courses taken by students in this sample since the end of their first year in college.

Course	No. of student-terms	Reasons for taking course: Req	Major	Elective	Suggested	Grades in course: A	B	C	D	E	No. of different Texts	Most frequently listed Authors
Calculus	142	39	42	23	1	27	35	25	8	3	22	Taylor; Johnson-Kiekemeister; Thomas; Buck
Engineering Math	7	3	2			3		2			3	Wilks; Kreyseig
Analytic Geometry	12	3	6	4		1	6	3	2		5	Purcell; Rainville
Differential Equations	48	15	18	7	1	11	8	11	0	1	12	Kaplan; Martin-Reissner; Rainville
Algebra and Trigonometry	11	4	5	2		5	4	2			6	Fisher-Ziebur; Vance
Computer Math	5			3		1	2				3	Germain; McCracken
Linear Algebra	11		6	3	1	5	2	1	1		6	Shields; Hoffman-Kunze
Vector Analysis	2		2								2	Kaplan; Davis
Number Theory	1		1								1	Wiven
Modern Algebra	19	4	5	5		1	4	5			10	McCoy; Birkhoff-Maclane
Statistics and Probability	17	4	7	6		4	6				11	Wilks; Brunk
Other	79	31	23	5		23	16	15	3		28	
Totals Σ	354	103	117	58	3	81	83	64	14	4		
ΣΣ					281						246	
Percentages*		36.7	41.6	20.6	1.0 99.9	32.9	33.7	26.0	5.7	1.6	99.9	

*These percentages are restricted to the parts of Table 12 in which they are found. i.e. they are percentages of reasons or percentages of grades not percentages of the total sample of students.

Of the 299 students who returned this questionnaire, 176 (58.9%) of them listed mathematics courses they had taken since the end of their first year of college, 58 (19.4%) indicated that they had taken no mathematics courses in their second college year, and 65 (21.7%) made no response to this item. The percentage of students who did not take any mathematics during their second college year might, therefore, be anywhere from 19.4% to 41.1% of the 299 respondents. On the average, those students who did take some mathematics took two terms in their sophomore year (i.e. 176 students took 354 terms). Of the 281 who listed a reason for taking some mathematics, 36.7% took it as a required course, 41.6% indicated "major" as the reason for taking their courses, 20.6% said that they took mathematics because they "wanted to", and the remaining 1% listed "suggested" as a reason. Of those students who recorded their grades, 66.6% of them received A or B while 7.3% received D or E.

The remainder of the second questionnaire to the 1962 graduates consisted of a series of items to sample attitudes of these students toward mathematics generally and the mathematics instruction they had received in UICSM courses in high school. Since the sample of 1963 graduates received these same items on a questionnaire, both sets of responses will be treated together later in this report.

3. The Sample of Students Who Graduated from High School in 1963.

3.1 Description of the Sample

A total of 728 high school students, who graduated from 54 high schools in 1963 and had studied one or more years of UICSM mathematics, were included in a questionnaire survey in the Spring of 1964. The mean age of these students was 18.5 year with their ages being distributed as: 17 (2.9%), 18 (57.8%), 19 (38.2%), 20 (0.8%). The sample of 728 students (63.9% return) was composed of equal numbers of boys and girls who

returned the questionnaires mailed out to 1,141 of the 1963 graduates. The total group of students was attending 279 colleges in 38 states, Canada, and Belgium. A more detailed listing of colleges attended has been included in Appendix D, along with a distribution of the students by states for both the respondents and non-respondents combined in Appendix F.

3.2 Discussion of the Questionnaire

The questionnaire for this sample resembled the second questionnaire that was used for the sample of 1962 graduates. It consisted of some items of a clerical nature along with samplings of specific educational outcomes. The variables which were surveyed included aptitude, sex, number of semesters of studying mathematics, grade-point averages, and a set of questions related to attitudes. The ariables are listed briefly in Table 21, which is a matrix of correlation coefficients from which some relationships may be noted. The exact and complete forms of the questions can be found in the sample questionnaire which is included as Appendix C.

3.3 Discussion of the Findings

Eighty-seven percent of the students in this sample took six or more semesters of UICSM mathematics in high school. Some took as few as two semesters; others, who started in the 8th grade took as many as ten semesters of UICSM. A number of these students also took some non-UICSM mathematics courses including traditional algebra and geometry courses, analytic geometry, calculus, and probability and statistics. More detailed analysis of the number of semesters of UICSM and traditional mathematics is given in Table 13.

Table 13. The distribution of the number of semesters of mathematics taken by the sample of 1963 H. S. graduates.

No. of Semesters		0	1	2	3	4	5	6	7	8	9	10	Blanks	Totals
UICSM	No.	0	0	28	11	42	11	181	40	368	5	39	3	728
	%	0	0	3.8	1.5	5.8	1.5	24.9	5.5	50.5	0.7	5.4	0.4	100.0
Non-UICSM	No.	519	52	118	4	25	0	6	0	0	0	4	4	728
	%	71.3	7.1	16.2	0.5	3.4	0	0.8	0	0	0	0.5	0.5	99.8

It is of interest to know the distribution of grades received by UICSM students. Overall high school grade-point averages and high school mathematics grade-point averages were obtained for the students in the 1963 sample and are given in Table 14. 64.9% of these students had overall grade-point

Table 14. Grade-point averages.

	[1.0-2.5]	[2.5-3.0]	[3.0-3.5]	[3.5-4.0]	[4.0-4.5]	[4.5-5.0]	Blanks	Σ
Overall HS GPA	1	6	77	167	235	237	5	728
%	0.1	0.8	10.6	22.9	32.3	32.6	0.7	100.0
HS Math GPA	7	28	150	104	186	245	8	728
%	1.0	3.8	20.6	14.3	25.5	33.7	1.1	100.0

averages of 4.0 or better, while 59.2% had mathematics averages 4.0 or better, so that these students represent a better-than-average group of high school graduates. All but about 1% of this group answered the question asking for grade-point averages.

Although most (87%) of these students had been in college for one complete academic year, there was some variability in the number of terms of college attendance. These variations are given in detail in Table 15.

Table 15. Numbers of college terms completed by students in this sample.

	1	2	3	4	5	Σ
Semesters	54	512	0	2		568
Quarters	15	8	92	3		118
Trimesters	2	29	21	2	1	55
						741*
Summer sessions	5					5
						746

*The total number of terms listed (741) exceeds the total number of students (728) because some students recorded numbers of terms for more than one type of college term.

There were 702 students (96.4%) in this sample who indicated that they were full-time college students at the time of the questionnaire return. Furthermore, 504 students (69.3%) felt that there was little likelihood that they would change their major field; while 185 students (25.4%) thought that they would change their major, and 39 students (5.4%) gave no response on this item. Concerning the possibility of attending graduate school; of these students 206 (28.3%) said it was very likely, 284 (39.0%) said it was likely, 182 (25.0%) indicated that it was unlikely, only 41 (5.6%) stated that it was very unlikely. So, in terms of these students' perceptions of their circumstances, 67.3% of this group rather expected to attend graduate school.

Each student was asked to list his or her major field of study in college. 92 different fields were listed, but only those having a frequency of ten or more are recorded in Table 16 below.

Table 16. Major fields which had a frequency of 10 or more as listed by these students.

Major field	Number of students (and %)
Mathematics	65 (8.9)
Education (Elem. and Sec.)	64 (8.8)
Engineering (7 types listed)	59 (8.1)
Business	50 (6.9)
English	34 (4.7)
Biology	32 (4.4)
Pre-med	23 (3.2)
Chemistry	21 (2.9)
Physics	19 (2.6)
Accounting	15 (2.1)
Art (Fine and Applied)	14 (1.9)
Psychology	14 (1.9)
Political Science	14 (1.9)
Nursing	13 (1.8)
History	13 (1.8)
Zoology	10 (1.4)
Others (less than 10 responses each)	140 (19.2)
Undecided	128 (17.6)
Totals	728 (100.1)

26.9% chose mathematics, engineering, or natural science as a major field. It is interesting to note that education (8.8%) was the second largest category.

Table 17. Occupational classification of UICSM students for occupations indicated in 5 or more responses.*

	Number of students (and %)
Accountants and auditors	16 (2.2)
Architects	6 (0.8)
Artists and art teachers	13 (1.8)
Authors	5 (0.7)
Chemists	14 (1.9)
College professors and instructors	6 (0.8)
Engineers (8 types)	47 (6.5)
Lawyers and judges	21 (2.9)
Biological scientists	5 (0.7)
Physicists	10 (1.4)
Miscellaneous natural scientists	7 (1.0)
Nurses, professional	12 (1.6)
Pharmacists	5 (0.7)
Physicians and surgeons	43 (5.9)
Social Scientists	12 (1.6)
Teachers, elementary	24 (3.3)
Teachers, secondary	25 (3.4)
Teachers (not elsewhere classified)	107 (14.7)
Technicians, medical and dental	7 (1.0)
Veterinarians	5 (0.7)
Business managers	33 (4.5)
Others	97 (13.3)
Undecided	208 (28.6)
Total	728 100.0

In Table 17 of occupations, engineering and the natural sciences account for 11.5% of the student choices. Teaching accounts for 22.2% of the occupational choices.

* These occupational classifications were found in Classified Index of Occupation and Industry, U.S. Bureau of Census, 1960, pp. XIX-XXIV.

The UICSM students in the sample of 1963 high school graduates were asked to give information on the college mathematics courses they had taken in their first year of college. This information was to include course titles, text authors, terms when studied, year, reasons for taking the courses, and grades received. It was hoped that this data would give a useful (though partial) picture of the mathematical activities of this sample of UICSM students. The responses to this question are summarized in Table 18. Since the data is rather incomplete, only general impressions can be obtained.

Table 18. Some data related to mathematics courses taken by UICSM students in the sample of 1963 high school graduates.

Course	No. of different texts listed	Terms when studied			Year			Reason for taking course*					Grades				
		Fall	Sp.	Su.	'62	'63	'64	1	2	3	4	5	A	B	C	D	E
Calculus	34	187	197	7	10	180	187	62	43	41	2	92	80	94	62	19	1
Statistics	9	3	6	0		3	8	7	2	1	0	1	5	3	0	0	0
Pre-calculus (Alg., Trig., Geom.)	59	123	76	0	2	117	87	97	16	49	4	30	53	64	42	11	6
Business	12	12	10	1	0	14	10	6	4	1	0	12	7	4	7	0	0
Differential Equations	7	2	7	0	0	2	7	2	1	0	0	2	2	2	0	1	0
Other (General)	35	18	13	2	0	20	11	22	0	2	0	5	11	10	7	1	1
Σ	156	345	309	10	12	336	310	196	66	94	6	142	158	177	118	32	8
ΣΣ	156			664			658					504					493

* 1 = Required by college, 2 = Math major, 3 = Wanted to, 4 = Suggested, 5 = Required for major (e.g., physics).

One thing that stands out in Table 18 is the large number of different texts that are used for these courses. This is one problem which must be met by a "college preparatory mathematics" sequence in high school. Although the concepts may be constant over the set of texts for a course, neither the approach nor the symbolism can be expected to be so.

It may be noted from Table 18 that at least 12 students (Year '62) took some college mathematics in high school. (Whether or not other students took college courses in the spring of 1963 is not clear.) The 504 reasons that were given for taking these mathematics courses were divided as follows: 38.9%-required by the college, 13.1%-required for a major in mathematics, 18.7%-wanted to, 1.2%-suggested to the student, 28.2%-required for another major (e.g., physics). It is evident that mathematics courses listed as a requirement account for about 80% of these responses. (These were free responses, not multiple choice.) The 493 grades recorded tended to accumulate more at the A-B end of the scale than in the D-E region. It is difficult to say what the distribution might be if the 171 missing grades were known.

The last item on the questionnaire to the 1963 graduates requested, "indicate anything about (your) UICSM courses which you especially liked or disliked." The responses which occurred five or more times seemed to fall into three broad areas--those related to teaching, content, and texts. These comments are summarized separately as "Liked" or "Disliked" in the paragraphs below. In these lists an additional section in each group lists other comments which occurred 2-4 times. An attempt has been made to use the same, or very similar, wordings as those used in the responses written to the questionnaires

Liked Teaching: "thinking for yourself" approach 58; approach (why instead of how) 53; teacher 35; methods in teaching concepts 13; precise, specific terminology 13; presentation of material 11; challenge 10; not just memorization 10; careful and thorough explanations 7; humor 6; basic principles 5;
Content: logic 31; theory 30; interesting material 13; geometry 8; having to do proofs 7; algebra part 6.
Texts: original loose-leaf books 12; soft-covered books 7; printed on only one side 6; interest in improving, revising the course 5.
Other comments (2-4 occurrences): informality 3, section on reasoning 3, shown to be more abstract than usually thought 2, examples 3, continuity 4, discovery 3, method of proof 2, less drill and more understanding 2, organization 2, problems 4, geometry proofs 2, trigonometry 4, unit circle approach to trigonometry 2, separation of classes according to ability 2, being able to take notes in the books 3, induction 2, liked as a whole 2, prepared more adequately 2.

Disliked Teaching: a particular teacher 21; instructor not qualified 16; didn't see practicality 16; not enough practical problems 15; grouping of students 14; speed 10; the fact that the teacher didn't fully explain 7; constant reference to Zabranchburg 6; disliked the standardized tests 6.

Content: lack of an introductory unit to calculus 11; what we were studying 9; geometry 8.

Other comments (2-4 occurrences): the fact that we were never sure where the problem was leading until it was all finished 2; proofs 3; students 2; odd symbols 3; lack of review 3; trig not sufficient preparation for calculus 2; no continuity 2; too much covered 2; no logs 2.

It seems that these students did enjoy having the theory and understanding which carried them beyond the traditional drill and that they enjoyed being challenged, so long as the presentations of the material were carefully and thoroughly done. Mainly, these students disliked those teachers and practices which they perceived as ill-prepared.

Overall college grade-point averages and college mathematics grade-point averages were obtained from many of the respondents although some students did not provide this information. The data for the 299 students in the 1962 sample and for the 728 students in the 1963 sample are summarized in the following tables.

Table 19. Overall college grade-point averages for the 1962 and 1963 samples combined.

GPA Sample	Blanks	[1.0-2.0]	[2.0-2.5]	[2.5-3.0]	[3.0-3.5]	[3.5-4.0]	[4.0-4.5]	[4.5-5.0]	Σ
1962	21	2	5	12	45	87	84	43	299
%	7.0	0.7	1.7	4.0	15.1	29.1	28.1	14.4	100.1
1963	62	4	12	42	170	190	166	82	728
%	8.5	0.6	1.6	5.8	23.4	26.1	22.8	11.3	100.1

Table 20. College mathematics grade-point averages for the 1962 and 1963 samples combined.

Sample	Blanks	[1.0-2.0]	[2.0-2.5]	[2.5-3.0]	[3.0-3.5]	[3.5-4.0]	[4.0-4.5]	[4.5-5.0]	Σ
1962	150	3	6	4	35	7	52	42	299
%	50.2	1.0	2.0	1.3	11.7	2.3	17.4	14.0	99.9
1963	265	8	25	16	90	32	148	144	728
%	36.4	1.1	3.4	2.2	12.4	4.4	20.3	19.8	100.0

From Table 20 it is apparent that only about 49% of the 1962 sample and 64% of the 1963 sample recorded any grades for mathematics courses. The "Blanks" designation includes both students who responded "none" to this item and those who did not respond at all to this item; so that it is not possible to say exactly how many students took a mathematics course but did not respond. 37.6% of the students, from both samples, who did record their mathematics grades reported grade-point averages of 4.0 or higher.

The following statements are inferences which are made by considering the significant correlations which exist among the variables in Table 21 and the means for these variables in Table 22. The critical reader will want to check the inferences made, by comparing values from Tables 21 and 22 for the variables discussed. First, it may be noted that those UICSM students who obtain high DAT-Verbal scores also tend to have high DAT-numerical scores, tend to take more semesters of UICSM mathematics, tend to have higher grade-point averages both in high school and college, and seemed to take more mathematics beyond calculus in college. There exists a positive correlation (significant at the 1% level) between DAT-V and question 7 in the questionnaire (related to heterogeneous grouping) which implies that students with higher DAT-V scores favor heterogeneous grouping in classes, while those students

with lower scores tend to favor homogeneous grouping.* However, consideration of Table 23 shows a low mean of 25 for question 7, which implies that the sample of students as a whole tended to favor homogeneous grouping.

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* A scale ranging from 10 to 70 (left to right) was used to quantify the responses to the questionnaire items related to attitudes (Appendix B), in order that the scores could be analyzed statistically.

Table 21-1. Matrix of Correlation Coefficients (1963 graduates) †

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1 DAT-V	435 1																		
2 DAT-N	**433** **.46**	452 1																	
3 Age	**434** **.15**	**451** **.30**	727 1																
4 Sex	434 .00	451 -.12	726 -.06	728 1															
5 Sem. UICSM Math.	**435** **.15**	**452** **.17**	727 -.05	**726** **-.21**	728 1														
6 Sem. Other Math.	432 -.07	449 -.06	724 .05	724 -.08	**725** **-.42**	725 1													
7 Beyond H.S. Math.	**155** **-.23**	**154** **-.24**	**214** **-.26**	**215** **.18**	**215** **-.19**	**213** **.44**	215 1												
8 Calculus in H.S.	157 -.09	162 -.07	**220** **-.33**	221 -.13	221 .15	**219** **.49**	**193** **.30**	221 1											
9 H.S. Ave.	**431** **.44**	**447** **.26**	721 -.03	**721** **.12**	**723** **.16**	720 .01	214 .02	219 -.07	723 1										
10 H.S. Math. Ave.	**428** **.37**	**444** **.35**	719 -.07	720 -.10	**721** **.35**	719 .04	**212** **.27**	**217** **.30**	**729** **.64**	721 1									
11 Sem. College	432 .00	449 -.01	724 .08	724 -.01	725 -.01	723 .04	215 .09	221 -.16	720 .04	718 .06	725 1								
12 % Time as student	429 -.01	446 -.01	721 .02	721 -.02	723 -.08	721 .03	214 -.05	220 -.03	717 -.07	716 -.10	**721** **-.13**	722 1							
13 Major	424 -.04	**441** **-.22**	712 -.05	**712** **.14**	**713** **-.18**	712 -.07	204 .12	**215** **-.20**	708 -.05	**707** **-.29**	712 -.01	712 -.01	713 1						
14 Grad. Sch. (Plan to go to) 1st College Course	424 .00	441 -.05	712 .05	**713** **.30**	**714** **-.21**	712 -.01	209 .07	215 -.16	**709** **-.15**	**708** **-.19**	711 -.01	711 .06	704 .04	714 1					
15 Pre. Analyt.	286 .11	299 .10	498 .00	**500** **-.14**	520 .08	498 -.01	160 -.13	165 .08	**496** **.13**	**496** **.15**	499 .01	449 -.04	493 -.11	495 .01	500 1				
16 Analyt. or Calculus	180 -.01	191 .02	338 .03	340 -.05	340 .00	338 .11	115 .16	120 .06	336 .14	**337** **.05**	339 .07	339 -.04	337 .03	337 -.05	**340** **.58**	340 1			
17 Other Math. Taken	**20** **.61**	29 .31	61 .20	61 -.22	61 -.06	61 .22	**21** **-.59**	22 -.19	60 .30	60 .11	61 .02	61 -.02	61 -.22	61 -.29	**61** **.50**	60 .45	61 1		
18 College Math. Ave.	265 .11	**278** **.21**	465 -.01	467 -.02	**467** **.14**	465 .03	151 .09	157 .12	**463** **.35**	**463** **.43**	466 .00	466 -.09	460 -.12	**461** **-.18**	466 .04	332 -.03	**61** **.40**	467 1	
19 College Ave.	**395** **.30**	**410** **.18**	669 -.01	670 .00	**671** **.14**	669 -.05	205 -.06	212 .15	**617** **.49**	**666** **.43**	670 .04	669 -.10	661 -.11	**662** **-.22**	491 .08	334 .02	60 .14	**460** **.39**	671 1

† See computer codings in Table 22.

Table 20
Complete 36 X 36 matrix

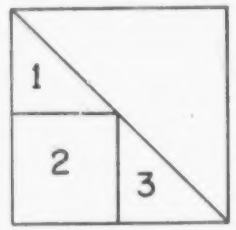


Table 21-2. Matrix of Correlation Coefficients (1963 graduates)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
20 Question 1 math interest	404 .09	418 .16	680 −.02	681 −.11	682 .43	679 −.06	206 .07	211 .07	678 .18	675 .46	679 .04	677 −.06	609 −.27	678 −.17	479 .03	328 .09	61 −.35	448 .16	648 .16	692 1
21 Question 2 math avoidance	271 −.03	305 −.26	405 −.03	485 .17	486 −.37	485 −.05	143 −.21	143 −.25	404 −.11	402 −.48	485 .02	485 .02	479 .54	478 .11	364 −.15	254 .12	46 .19	342 −.17	458 −.10	462 −.68
22 Question 3 teacher explanations	419 −.02	436 −.05	706 .01	707 .05	708 −.22	705 .01	213 .00	219 .01	704 −.13	701 −.27	705 −.03	703 .06	694 .10	697 .08	493 −.07	339 −.06	61 −.02	400 −.06	656 −.06	667 −.46
23 Question 4 teachers	411 .03	428 .09	692 −.02	693 .01	694 .32	691 −.06	209 .06	214 .07	690 .18	687 .38	691 .00	689 −.07	680 −.18	682 −.15	486 .05	337 .10	61 −.27	452 .14	644 .28	658 .70
24 Question 5 drill	350 .08	365 .06	602 −.04	602 −.14	603 .17	601 .00	181 .12	185 .05	600 .17	598 .24	601 .09	579 −.03	592 −.13	592 −.09	419 .14	288 .14	54 .16	393 .17	557 .21	572 .25
25 Question 6 applications	383 .06	400 .08	651 −.08	651 −.11	652 .23	650 .00	190 .06	195 .14	648 .16	645 .22	650 −.03	650 −.09	641 −.09	644 −.11	447 .06	303 .07	55 −.12	418 .21	604 .23	616 .31
26 Question 7 grouping	419 .20	433 .04	697 .01	698 −.02	699 .00	696 −.02	211 .096	215 .04	695 −.14	692 −.12	696 −.03	694 −.03	685 .05	688 .05	479 −.02	326 −.05	59 −.39	448 −.03	645 −.06	659 .05
27 Question 8 grouping	404 .05	420 .10	672 .05	672 .07	673 .22	672 −.08	205 .08	210 .11	669 .12	667 .25	671 −.02	671 −.01	664 −.07	666 −.08	466 .07	315 .07	58 −.22	434 .10	625 .14	635 .30
28 Question 9 college prep.	296 .11	309 −.13	519 −.00	521 −.02	521 −.26	519 .03	163 −.07	167 −.05	518 −.11	517 −.18	520 .01	520 −.04	513 .10	516 .08	486 .08	332 −.03	59 −.04	455 −.42	507 −.23	498 −.35
29 Question 10 non-math courses	372 −.08	389 −.16	619 −.06	620 .02	621 −.22	619 .05	187 −.02	189 .06	617 −.05	616 −.13	620 −.01	619 .02	609 −.01	614 .07	427 −.04	290 −.08	51 −.07	399 −.14	578 −.09	592 −.35
30 Question 11 traditional	358 −.01	374 .13	602 −.08	604 −.06	604 .36	602 −.11	173 .03	179 .18	600 .15	599 .33	601 .05	601 −.06	596 −.18	596 −.13	423 .06	291 .05	53 −.30	396 .26	560 .19	575 .68
31 Question 12 advantage	313 −.18	326 .08	539 −.01	540 −.03	541 .23	539 −.11	175 .08	180 .12	539 .03	535 .14	540 .04	540 .05	532 −.01	536 −.12	448 −.08	308 −.06	56 −.38	418 .36	515 .22	599 .44
32 Question 13 coll. math difficult	281 .20	294 .20	491 .02	493 −.22	493 .17	491 .11	460 .15	464 .20	492 .14	491 .26	492 −.02	492 .02	487 −.25	487 −.06	478 .09	329 .05	59 −.11	446 −.27	489 −.02	471 .31
33 Question 14 theory in UICSM	275 .02	288 −.08	482 .01	484 −.04	484 .18	482 −.19	156 −.16	160 −.15	481 .04	481 .07	483 .07	483 −.08	477 .08	479 .00	467 −.01	328 −.03	58 −.13	440 .09	475 .08	464 .06
34 Question 15 need more theory	257 .10	270 −.03	454 −.02	456 .01	456 −.04	454 −.06	148 −.04	151 −.10	453 .10	453 .08	455 −.02	455 −.00	449 −.02	452 −.08	430 .02	305 −.15	54 .30	404 .07	445 .13	437 .22
35 Question 16 college - concepts	282 −.10	295 −.02	496 .02	498 .10	498 −.12	496 .07	159 .18	162 .22	495 −.02	495 −.02	497 .10	497 −.05	490 −.06	493 −.07	487 −.00	333 −.04	59 −.20	455 .02	488 .05	477 −.02
36 Question 17 college math - interest	263 .11	274 .08	453 .01	455 −.01	455 .15	454 −.10	147 −.23	151 .03	452 .11	452 .08	454 .12	454 −.14	449 .18	450 .10	445 .04	313 .07	53 −.34	436 −.23	447 −.06	438 .12

Table 21-3. Matrix of Correlation Coefficients (1963 graduates)

	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
21 Question 2	486 1															
22 Question 3	**477** **.39**	708 1														
23 Question 4	**465** **-.47**	**687** **-.61**	694 1													
24 Question 5	**407** **-.24**	**591** **-.13**	**583** **.26**	603 1												
25 Question 6	**439** **-.25**	**637** **-.15**	**625** **.28**	**561** **.39**	652 1											
26 Question 7	465 -.02	684 -.03	671 .10	587 -.06	627 .01	699 1										
27 Question 8	**456** **-.20**	**660** **-.18**	**648** **.33**	564 .09	606 .09	**657** **.22**	673 1									
28 Question 9	**379** **.31**	**513** **.28**	**506** **-.25**	**440** **-.21**	**467** **-.27**	500 -.04	**483** **-.21**	521 1								
29 Question 10	**421** **.31**	**608** **.26**	**595** **.26**	524 -.07	572 -.18	558 .02	583 -.12	**447** **.35**	621 1							
30 Question 11	**411** **-.17**	**592** **-.33**	**580** **.51**	**513** **.30**	**546** **.34**	564 .05	**565** **-.31**	**445** **-.54**	**525** **.35**	604 1						
31 Question 12	**384** **-.30**	**533** **-.25**	**528** **.37**	**456** **.19**	**494** **.25**	522 .05	**510** **.24**	**463** **-.64**	**475** **-.35**	**471** **.67**	541 1					
32 Question 13	**361** **-.33**	485 -.05	479 .10	**416** **.13**	443 .11	473 -.07	460 -.04	**474** **.23**	421 .11	419 .02	**443** **-.25**	493 1				
33 Question 14	354 .01	**477** **-.13**	**471** **.12**	411 .06	440 .02	465 .00	450 .10	466 -.11	**420** **-.23**	411 .11	**441** **.19**	**464** **-.25**	484 1			
34 Question 15	332 -.11	449 -.02	**446** **.19**	390 .09	419 .09	459 -.10	430 .12	434 -.10	**402** **-.16**	**339** **.21**	**412** **.28**	**426** **-.23**	**435** **.48**	456 1		
35 Question 16	366 -.01	491 .06	484 .05	422 .11	447 .00	479 .05	464 -.09	481 -.04	**427** **.14**	422 .00	450 .00	477 .12	**467** **-.31**	432 **-.35**	498 1	
36 Question 17	339 .12	448 -.09	442 .08	388 .02	**411** **.14**	438 .02	429 .03	**440** **.15**	400 -.01	392 .08	413 -.00	**433** **.16**	**428** **.29**	**400** **.14**	**443** **-.36**	455 1

Table 22. Sample sizes, means, and standard deviations of "scores" (coded or actual) for variables in the 1964 follow-up study of UICSM students.

Variable (computer code, if used)	N	Mean	S. D.
1. DAT-V	435	28.7	7.77
2. DAT-N	452	25.8	6.71
3. Age	727	18.5	5.07
4. Sex (0 male, 1 female)	728	.50	.51
5. Sem. UICSM	728	6.98	1.77
6. Sem. other	725	.62	1.15
7. Beyond H. S. math. (1 yes, 0 no)	215	.30	.65
8. Calculus (1 yes, 0 no)	221	.35	.65
9. H. S. ave.	723	4.078	.54
10. H. S. math. ave.	721	3.97	.74
11. Sem. college	725	2.019	.45
12. % time (1 full-time, 2 half-time, 3 < half-time)	722	1.04	.26
13. Major (1 math., 2 science, 3 other)	713	2.64	.72
14. Grad School (1 → 4 for very likely → very unlikely)	714	2.07	.88
1st college course			
15. Pre-analyt (1 1st semester, 2 2nd semester, 3 3rd repeater)	500	1.63	.76
16. Analytic geometry or calculus	340	1.89	.70
17. Other	61	2.11	.66
18. Coll. math. ave.	467	3.04	.99
19. Coll. ave.	671	3.64	.687

Table 22 is a list of numbers of respondents for 19 of these variables, along with the means and standard deviations of the responses. This table also includes, for some of the variables, the computer codings that were used. This information will be helpful for interpreting the corresponding means and standard deviations. Distributions of the responses to the questions related to attitudes are also given in Table 23 along with means and standard deviations. The format used in the distributions of responses of the 1962 and 1963 graduates to the attitude inventory items is as follows. The items are reproduced as in the questionnaire (except for the "No opinion" check box in items 1-17) and the number of students giving each response from each of the two samples are given immediately above or below the response scale. Above and below these numbers are the percentages for each response from the corresponding sample. The data for the 1962 sample are above the scale, while the 1963 data are below the scale. A column, entitled "blanks" giving the numbers and percents of students who did not answer an item, has also been added, along with an additional column for totals. Means and standard deviations are listed under the B end of the scale, as in the format below.

Statement A		Responses	Statement B
	%		
1962			
	No.		
		–	–
	No.		
1963			
	%		

Mean = S.D. =

The scale division points were calibrated from 10 to 70 for computing means and standard deviations of responses.

TABLE 23

VARIABLE		QUESTION	BLANKS							Σ	
		A	5.4	2.3	6.4	8.0	10.7	19.4	47.8	100.0	B
20.	1.	My UICSM courses stifled my interest in mathematics.	16	7	19	24	32	58	143	299	My UICSM courses stimulated my interest in mathematics.
			51	30	38	52	83	144	330	728	
			7.0	4.1	5.2	7.1	11.4	19.8	45.3	99.9	
									Mean = 52		S.D. = 16
		A									B
21.	2.	My UICSM mathematics background contributed toward my selection of a major in mathematics or a strong math-related field.	31.1	12.4	15.4	12.0	11.7	7.4	10.0	100.0	My UICSM mathematics background contributed toward my avoidance of a major in mathematics or a strong math-related field.
			93	37	46	36	35	22	30	299	
			242	67	106	66	121	48	78	728	
			33.2	9.2	14.6	9.1	16.6	6.6	10.7	100.0	
									36		17
		A	3.0	33.8	32.4	10.7	9.0	4.7	6.4	100.0	B
22.	3.	My UICSM teachers explained the concepts very well.	9	101	97	32	27	14	19	299	My UICSM teachers explained the concepts very poorly.
			21	310	211	77	43	25	41	728	
			2.7	42.6	28.8	10.6	5.9	3.4	5.6	99.8	
									23		15
		A	3.7	3.0	6.4	5.0	9.7	20.4	51.8	100.0	B
23.	4.	My UICSM teachers made mathematics dull for me.	11	9	19	15	29	61	155	299	My UICSM teachers made mathematics interesting to me.
			35	23	38	49	64	126	393	728	
			4.8	3.2	5.2	6.7	8.8	17.3	54.0	100.0	
									54		16
		A	19.7	10.7	13.7	22.1	24.7	6.0	3.0	99.9	B
24.	5.	There should be more drill work in the UICSM courses.	59	32	41	66	74	18	9	299	There should be less practical application in the UICSM courses.
			125	107	110	140	176	40	30	728	
			17.2	14.7	15.1	19.2	24.2	5.5	4.1	100.0	
									31		14
		A	11.0	18.1	23.1	24.4	19.1	3.3	1.0	100.0	B
25.	6.	There should be more practical application in the UICSM courses.	33	54	69	73	57	10	3	299	There should be less drill work in the UICSM courses.
			77	161	200	154	115	12	9	728	
			10.6	22.1	27.5	21.2	15.8	1.6	1.2	100.0	
									26		12
		A	4.3	38.1	26.8	9.4	3.4	3.7	13.4	100.0	B
26.	7.	UICSM classes should be grouped according to math ability – that is, high-ability students in one class, average-ability in another and so forth.	13	114	80	28	13	11	40	299	UICSM classes should have students of different ability levels together in one class.
			30	308	169	73	26	43	79	728	
			4.1	42.3	23.2	10.0	3.6	5.9	10.9	100.0	
									25		18
		A	8.0	3.0	4.0	4.7	6.4	11.0	62.9	100.0	B
27.	8.	The way my UICSM classes were grouped was detrimental to me.	24	9	12	14	19	33	188	299	The way my UICSM classes were grouped was NOT detrimental to me.
			56	42	53	55	45	71	406	728	
			7.7	5.8	7.3	7.6	6.2	9.8	55.8	100.2	
									53		19

VARIABLE	QUESTION	BLANKS							Σ	
			1	2	3	4	5	6		
28.	9. My UICSM courses prepared me for my college math courses.	20.7	29.1	24.4	8.4	5.4	2.7	9.4	100.1	B: My UICSM courses did not prepare me for my college math courses. S.D. = 18
	A	62	87	73	25	16	8	28	299	
		207	225	139	48	27	26	56	728	
		28.4	30.9	19.1	6.6	3.7	3.6	7.7	100.0	
								Mean = 25		
29.	10. My UICSM training has helped me in my non-math content courses in college.	14.0	12.4	18.7	22.1	7.7	5.7	19.4	100.0	B: My UICSM training has not helped me in my non-math content courses in college. 18
	A	42	37	56	66	23	17	58	299	
		108	77	177	146	63	37	120	728	
		14.8	10.6	24.3	20.1	8.7	5.1	16.5	100.1	
								35		
30.	11. I would have received a better mathematics background in a traditional mathematics program.	14.4	6.4	5.4	3.7	7.0	12.0	51.2	100.1	B: My UICSM mathematics background is better than I could have received in a traditional mathematics program. 19
	A	43	19	16	11	21	36	153	299	
		125	42	54	45	46	79	337	728	
		17.2	5.8	7.4	6.2	6.3	10.9	46.3	100.1	
								51		
31.	12. I am behind other students in college because of my UICSM background.	25.8	1.0	2.3	3.7	18.1	18.4	30.8	100.1	B: I have an advantage over other students in college because of my UICSM background. 15
	A	77	3	7	11	54	55	92	299	
		188	17	20	34	125	121	223	728	
		25.8	2.3	2.7	4.7	17.2	16.6	30.6	99.9	
								51		
32.	13. My college mathematics courses are less difficult than my UICSM courses.	29.4	5.0	5.0	4.0	12.0	15.1	29.4	99.9	B: My college mathematics courses are more difficult than my UICSM courses. 19
	A	88	15	15	12	36	45	88	299	
		235	57	63	60	87	83	143	728	
		32.3	7.8	8.7	8.2	12.0	11.4	19.6	100.0	
								43		
33.	14. There is more emphasis on theory theory and understanding in my college math courses than there was in my UICSM courses.	29.1	5.0	5.4	8.4	14.4	13.7	24.1	100.1	B: There was more emphasis on theory and understanding in my UICSM courses than in my college math courses. 17
	A	87	15	16	25	43	41	72	299	
		244	26	39	37	91	79	212	728	
		33.5	3.6	5.4	5.1	12.5	10.9	29.1	100.1	
								49		
34.	15. There should be less emphasis on theory and understanding in my college math courses.	34.8	0.7	2.0	6.4	17.7	15.1	24.4	100.1	B: There should be more emphasis on theory and understanding in my college math courses. 14
	A	104	2	6	16	53	45	73	299	
		272	9	20	32	123	92	180	728	
		37.4	1.2	2.8	4.4	16.9	12.6	24.7	100.0	
								50		
35.	16. My college math courses are mainly courses in memorizing and applying rules and formulas.	27.4	5.4	11.7	12.7	7.4	10.4	25.1	100.1	B: My college math courses are mainly courses in learning and understanding mathematical concepts. 18
	A	82	16	35	38	22	31	75	299	
		230	82	86	78	46	81	125	728	
		31.6	11.3	11.8	10.7	6.3	11.1	17.2	100.0	
								39		
36.	17. My college mathematics courses have increased my interest in mathematics.	29.1	8.4	12.7	11.0	13.4	9.0	16.4	100.0	B: My college mathematics courses have decreased my interest in mathematics. 17
	A	87	25	38	33	40	27	49	299	
		273	36	70	79	130	59	81	728	
		37.5	4.9	9.6	10.9	17.9	8.1	11.1	100.0	
								40		

Concerning the distributions of the attitude inventory items, it may be noted that: the distributions for the two samples are quite similar in spite of the students in the 1962 sample being at the end of their sophomore year in college, and the students in the 1963 sample being at the end of their freshman year; further differences existed in sample size (299 and 728) and in the high schools from which these students came. There were in the 1962 sample 25 high schools and in the 1963 sample 53 high schools, with 23 high schools in the intersection of these two sets.

The last two items (questions 18 and 19, see Appendix B) on the questionnaire sampled the students' self images, and their opinions concerning which ability levels of students ought to be taught UICSM mathematics. All but 1.3% of the 1962 sample responded to the question related to the concept of their own ability levels. 31.8% felt they were of higher ability; 54.8% felt that they were of average ability; 9.0% felt themselves to be of lower-than-average ability; 3% said that they didn't know. 91% of the 1962 sample felt that UICSM mathematics should be taught to students of high ability; 76.9% felt that this content was suited to average ability students; while 26.8% indicated that the mathematics which they studied in their UICSM courses might be taught to low ability students.

The corresponding responses for the 1963 sample were as follows: self-perceptions of ability — high (33.5%), average (48.4%), low (11.3%); levels of ability to which UICSM mathematics should be taught — high (90.9%), average (76.8%), low (21.0%). These percents agree substantially with those of the 1962 graduates.

Those students having high [illegible]T-numerical scores tended to be older, to take more semesters of UICSM mathematics, to have higher grade-point averages, and to choose mathematics as a major in college. The mean of 52

on question 1 implies that these graduates felt that UICSM mathematics stimulated their interest in mathematics, and the positive correlation of DAT-N with question 1 indicates that the higher aptitude students tended to record more decidedly this feeling of stimulation. The significant correlation between DAT-N scores and question 2, together with the mean of 36 on question 2, may indicate that the more able of these students felt that the UICSM courses contributed toward their selecting mathematics or mathematics-related fields as their major field of study.

It has long seemed to be the case that traditional mathematics instruction has turned many people away from mathematics. It would be most welcome if the finding noted above could be taken as an indication of a reconstruction of attitudes in high school graduates, which could result in a greater appreciation of and use of each individual's mathematical talents. It is unfortunate that we have been unable to obtain data for comparison; however, the data may have some value for [illegible]e who can relate the population studied here to students about which they have some comparable information.

The mean age of students in this sample was 18.5 year and ranged from 17.5 years to 19 years, in the Spring of their freshman year in college. Some of the younger students took college mathematics courses, e.g. calculus, while still in high school; but this is the exception rather than the rule, as the .30 and .35 computed mean values for items 7 and 8 in Table 22 indicate.

Both of the high school grade-point averages (overall and math. only) correlate significantly with the perceived possibility of attendance in graduate school, and with the college total- and college math-gpa's. Those students who had higher secondary school averages felt that UICSM courses stimulated their interest in mathematics, believed that UICSM teachers explained concepts well, felt that more drill was needed in the UICSM courses, wanted more

applications, favored homogeneous grouping, and felt that they had received a better mathematics background in UICSM courses then they would have received in traditional courses. The better students also felt that college mathematics courses are harder than UICSM mathematics courses (contrary to misconceptions, relative to modern mathematics curricula, which are sometimes held by parents of high school students).

Concerning these categories of choice of major: (1) mathematics, (2) science, or (3) something else, students with high DAT-N tended to choose mathematics or science; boys mostly went into categories (1) and (2) and girls tended to choose something else. Those who took the most UICSM mathematics courses chose majors in mathematics or science, and this group tended to have higher mathematics averages in high school. The students who selected mathematics as a major field felt that UICSM mathematics had stimulated their interest in mathematics generally and had contributed toward their selection of mathematics as a major.

The college grade-point averages correlated significantly with DAT scores, the number of semesters of UICSM mathematics taken, the high school averages, and probability of attendance at a graduate school. These students who obtained higher college grade-point averages felt that UICSM courses had stimulated their mathematical interests, that UICSM teachers had explained concepts well, but that further drill work was needed in these courses. Furthermore, this group felt that UICSM mathematics had prepared them well for their college mathematics courses, better than could have been done by traditional courses.

Considering Table 23 and the questions on attitudes which may be found on the questionnaire in Appendix C, we may make some statements related to attitudes of the sample as a whole. These students felt that UICSM courses

stimulated their interest in mathematics and contributed toward their choice of a major in a strongly math-related field. It was a general feeling that UICSM texts and teachers explained the concepts very well. This may be due to the training which their teachers received at the UICSM summer institutes or may be a result of the better teachers choosing to teach UICSM mathematics, or both. Most of the students in the sample thought that there should be more drill and applications in the courses, a shortcoming which project staff members recognized and have attempted to remedy. The sample group as a whole favored homogeneous grouping of UICSM classes but felt that heterogeneous grouping was not detrimental to them.

The feeling was general among the students that UICSM courses prepared them for their college mathematics courses and even helped some in non-mathematics courses. It might be of interest to survey UICSM students to identify some of the specific forms of these by-products of UICSM course participation. There exists among UICSM students a feeling that their mathematics background is better than could have been received in traditional courses, and that it gives them some advantage over other students in college who had studied a traditional curriculum.

The graduates in this sample as a whole felt that their college mathematics courses were more difficult than their UICSM courses, but as a group there were doubts in the minds of some students, as attested to by the mean of 43 (almost at the middle of the scale) on attitude question number 13 dealing with a comparison of difficulty of UICSM and college mathematics courses. These doubts are compensated for, however, by their feelings of well-preparedness as mentioned previously. It was a common judgment among these students that there was more emphasis on theory and understanding in their UICSM courses than in their college courses; but also that there should be more emphasis on

theory and understanding in their college courses. The UICSM emphasis on theory, far from frightening these students, does appear to be appreciated as a basis for understanding, since they urge the greater use of well-organized theory in mathematics teaching to clarify and give structure to their mathematical understandings.

4. Summary and Conclusions

In summary, UICSM students like their high school mathematics and derive a feeling of understanding mathematics from it. These attitudes are maintained and reinforced when they compare their command of mathematics with that of their classmates in college. Further follow-up studies will be carried out on these and other UICSM students in order to prepare a record which teachers, administrators, and parents may use in making decisions related to this program in modern mathematics.

References

1. Tatsuoka, M.M. and Easley, J. A., Jr., Comparison of UICSM vs. "Traditional" Algebra Classes on Coop Algebra Test Scores, UICSM Research Report No. 1, September, 1963.

2. Flanagan, J. et al, Project Talent, The American High School Student, University of Pittsburgh, 1964.

3. Peden, I.C., The missing half of our technical potential: Can we motivate the girls?, The Mathematics Teacher, Vol. 58, No. 1, January, 1965, p. 2-13.

4. College Entrance Examination Board. College Board Score Reports: A guide for counselors. Princeton, 1960. 63 p.

5. Comley, R.E., A correlational study of achievement of students beginning UICSM high school mathematics in 1958 or 1959, UICSM Research Report No. 7, 1965.

6. Office of Education Studies and Surveys: Baccalaureates in Science and Mathematics in 1962. Higher Education 18:20-3, July 1962.

Appendix A

1st Year Follow-up Questionnaire for 1962 Graduates

I. Name _____ [ ]

II. What college or university are you attending?

_____ [ ]
(name) (city) (state)

III. Your address at college _____
(number and street)

_____
(city) (state)

IV. Your address at home _____
(number and street)

_____
(city) (state)

V. _____ 1. Male (check one)
_____ 11. Female

VI. _____ Age at last birthday

VII. Which does your college or university use: (check one)

_____ 1. the quarter system?
_____ 2. the semester system?
_____ 3. the trimester system?

VIII. When did you first register at your present college or university? (check one)

_____ 1. summer session (or summer quarter)
_____ 2. fall semester (or quarter)
_____ 3. winter semester (or quarter)

IX. Which are you considered: (check one)

_____ 1. a full-time student?
_____ 2. a half-time student?
_____ 3. a less than half-time student?

X. A. Please check each of the UICSM units which you studied in high school. Also, indicate the total number (1, 2, ... 11) of units you studied.

		Unit
_____	The Arithmetic of Real Numbers	1
_____	Generalizations and Algebraic Manipulations	2
_____	Equations and Inequations	3
_____	Ordered Pairs and Graphs	4
_____	Functions and Relations	5
_____	Geometry	6
_____	Mathematical Induction	(7) Course III, Unit 1
_____	Sequences	8
_____	Exponents and Logarithms	(9) Course III, Unit 2
_____	Circular Functions and Trigonometry	(10) Course IV, Unit 1
_____	Complex Numbers	(11) also called Course III, Unit 2
_____	Total number of units studied	

B. If you studied any mathematics in high school other than the UICSM units, please indicate what it was. Also, for each course, fill in the name and author of the textbook you used and check the number of semesters studied.

		Semesters	Text and Author
_____	Algebra I	__ 1 __ 2	_____
_____	Algebra II	__ 1 __ 2	_____
_____	College Algebra	__ 1 __ 2	_____
_____	Plane Geometry	__ 1 __ 2	_____
_____	Solid Geometry	__ 1 __ 2	_____
_____	Analytic Geometry	__ 1 __ 2	_____
_____	Trigonometry	__ 1 __ 2	_____
_____	Calculus	__ 1 __ 2	_____
_____	Introduction to College Mathematics	__ 1 __ 2	_____
_____	_____ (other - please specify)	__ 1 __ 2	_____

XI. Please check each science course you completed in high school.

_____ General Science
_____ Biology
_____ Chemistry
_____ Physics

_____ _____ (other)

XII. What was your overall grade average for your high school mathematics courses? (check one)

_____ 8. A
_____ 7. Between A and B
_____ 6. B
_____ 5. Between B and C
_____ 4. C
_____ 3. Between C and D
_____ 2. D
_____ 1. Between D and E or F
_____ 0. E or F

XIII. What was your overall grade average for your high school science courses? (check one)

_____ 8. A
_____ 7. Between A and B
_____ 6. B
_____ 5. Between B and C
_____ 4. C
_____ 3. Between C and D
_____ 2. D
_____ 1. Between D and E or F
_____ 0. E or F

XIV. Please check the name of each College Entrance Examination which you have taken.

_____ Scholastic Aptitude Test (SAT)
_____ Writing Sample (WS)
_____ American College Testing Program (ACT)
_____ Intermediate Mathematics Achievement Test
_____ Advanced Mathematics Achievement Test
_____ PSSC Physics Achievement Test
_____ Traditional Physics Achievement Test
_____ Combined Physics Achievement Test
_____ _____
(other - please specify)
_____ _____
(other - please specify)

XV. Have you ever received a scholarship or an award based on academic achievement, or a listing on your college's honor roll or Dean's list?

_____ 1. Yes
_____ 11. No

XVI. Please fill in the following table as completely as you can, describing the college mathematics courses you have studied or are now studying.

Under the column headed "Reason for Taking Course," please be as specific as you can.

Under the column headed "How did you enjoy this course?" please use the following 4-point scale.

4 - - - - - enjoyed the course very much
3 - - - - - enjoyed the course moderately well
2 - - - - - neither especially liked nor disliked the course
1 - - - - - disliked the course

		Title of Course	Title of Textbook and Author	Reason for Taking Course	Final Grade	How did you enjoy this course?
Example		Beginning Calculus	Calculus / Taylor	Required for my major	B	2
Mathematics Courses Studied during the Summer Session (or Quarter)	A_1					
	A_2					
Mathematics Courses Studied during the Fall Semester (or Quarter)	B_1					
	B_2					
Mathematics Courses Studied during the Winter Semester (or Quarter)	C_1					
	C_2					

XVII. Do you plan to take any more mathematics courses in college? (check one)

_____ 1. Yes
_____ 2. No
_____ 3. Undecided

XVIII. Please list the names of any other college courses you have taken or are now taking in which your mathematics helped in any way.

_____

_____

_____

_____

_____

XIX. A. Please check the field from which you are most likely to select your major.

_____ 1. mathematics (pure mathematics, applied mathematics, etc.)

_____ 2. engineering (civil, mechanical, electrical, etc.)

_____ 3. a physical science (physics, chemistry, geology, etc.)

_____ 4. a biological science (biology, botany, zoology, agriculture, etc.)

_____ 5. a social science (history, psychology, home economics, etc.)

_____ 6. a language (English, French, German, etc.)

_____ 7. a fine art (music, art, dramatics, etc.)

_____ 8. business (accounting, administration, etc.)

_____ 9. pre-professional (pre-medicine, pre-law, pre-dentistry, pre-nursing, etc.)

B. If you have decided on your major, please write your selection below.

I am majoring in _____.

XX. What do you feel that you will probably do after graduating from college? (check one)

_____ 1. Go on to graduate school

_____ 2. Begin working in your chosen field

_____ 3. _____
(something else - please specify)

_____ 4. I have no idea what I will do after graduation

XXI. This question is especially important, so please allow yourself a few minutes to think before answering.

In the table below list a few particular topics from one or more of your high school mathematics courses which you feel have been the most useful to you. Please give an example for each topic to show precisely what you mean.

	Topics	Examples	
SAMPLES	Scientific notation	Expressing .0000036 as 3.6×10^{-6}	SAMPLES
	Trigonometric identities	Equations like: $\sin^2 x + \cos^2 x = 1$	
	Solving inequalities	Finding the roots of: $3x - 4 < 12x$	

XXII. On this page please make any comments you wish about your high school mathematics program. We should like to have your personal evaluation of your training.

The University of Illinois Mathematics Project [UICSM] has my permission to obtain transcripts of my high school and college records

_____ _____

(signature) (date)

Appendix B

UICSM College Student Follow-up — Spring, 1964

2nd Year Follow-up of 1962 Graduates

UICSM College Student Follow-up Study -- Spring, 1964

Questionnaire

1. Name _____
   Last First Middle

2. Colleges and universities attended

Colleges and universities attended	City	State	Dates of attendance

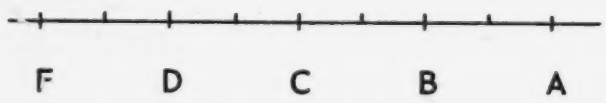
3. Number of terms of college work you will have completed at the end of the present term

   _____ Semesters _____ Quarters _____ Trimesters _____ Summer Sessions

4. Please fill in the table below for each math course you have taken since the end of your first year in college.

Course	Text-Author	Term(s) when studied	Year	Reason for taking course	Grade

5. Place an "X" on the scale below to indicate your cumulative average grade at the end of your last complete term

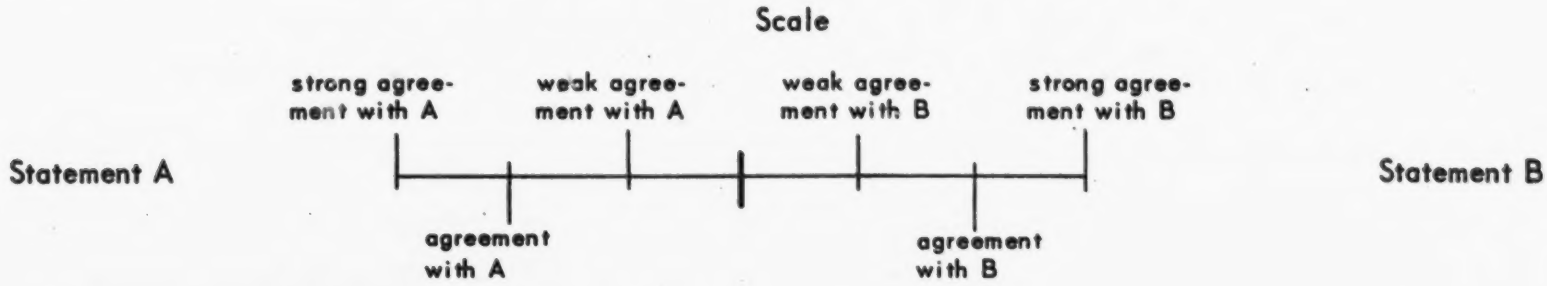


Inventory

The following statements were designed so that you can indicate what your personal opinions are about UICSM mathematics training and your present college mathematics training.

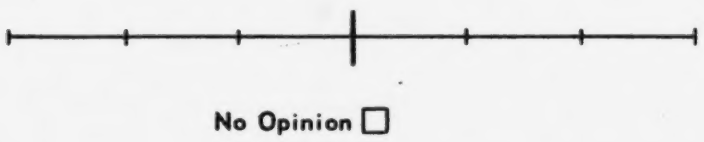
For each pair of statements A and B, place an "X" mark on the scale between them to show the relative strength of your agreement with statement A or statement B. Mark the middle of the scale if your feelings lie equally between the two statements.

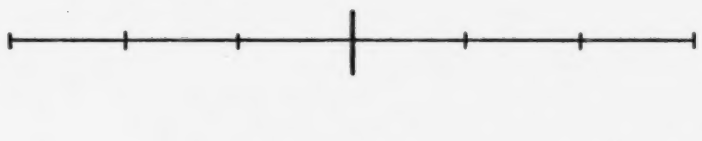
If neither statement applies to you, please check the box marked 'no opinion'.

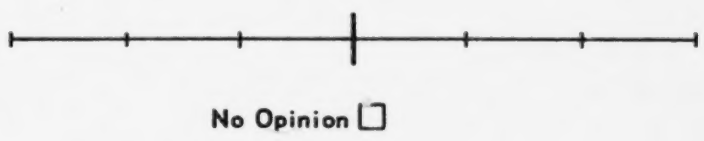


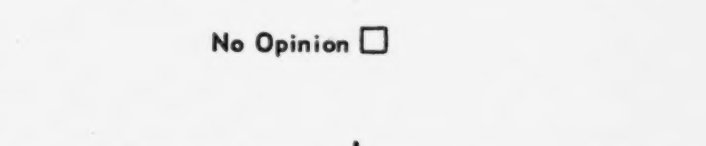
Example:

In this example, the student has indicated that he is in between weak agreement and agreement with Statement B.

1. 
A
My UICSM courses stifled my interest in mathematics
B
My UICSM courses stimulated my interest in mathematics
No Opinion ☐

2. 
A
My UICSM mathematics background contributed toward my selection of a major in mathematics or a strong math-related field
B
My UICSM mathematics background contributed toward my avoidance of a major in mathematics or a strong math-related field
No Opinion ☐

3. 

4. 

5.

A

6. There should be more practical application in the UICSM courses

B

There should be less practical application in the UICSM courses

No Opinion ☐

A

7. UICSM classes should be grouped according to math ability -- that is, high-ability students in one class, average-ability in another, and so forth

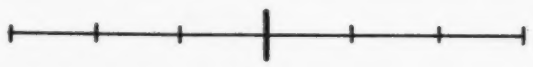
B

UICSM classes should have students of different ability levels together in one class

No Opinion ☐

A

8. The way my UICSM classes were grouped was detrimental to me



B

The way my UICSM classes were grouped was NOT detrimental to me

No Opinion ☐

A

9. My UICSM courses prepared me for my college math courses

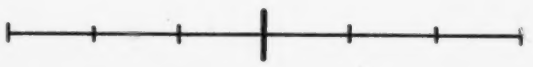
B

My UICSM courses did not prepare me for my college math courses

No Opinion ☐

A

10. My UICSM training has helped me in my non-math content courses in college



B

My UICSM training has not helped me in my non-math content courses in college

No Opinion ☐

A

11. I would have received a better mathematics background in a traditional mathematics program

B

My UICSM mathematics background is better than I could have received in a traditional mathematics program

No Opinion ☐

A

12. I am behind other students in college because of my UICSM background

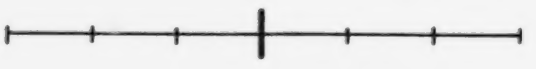
B

I have an advantage over other students in college because of my UICSM background

No Opinion ☐

A

13. My college mathematics courses are less difficult than my UICSM courses



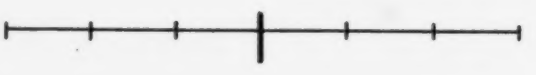
B

My college mathematics courses are more difficult than my UICSM courses

No Opinion ☐

A

14. There is more emphasis on theory and understanding in my college math courses than there was in my UICSM courses



B

There was more emphasis on theory and understanding in my UICSM courses than in my college math courses

No Opinion ☐

15. A: There should be less emphasis on theory and understanding in my college math courses

B: There should be more emphasis on theory and understanding in my college math courses

No Opinion ☐

16. A: My college math courses are mainly courses in memorizing and applying rules and formulas

B: My college math courses are mainly courses in learning and understanding mathematical concepts

No Opinion ☐

17. A: My college mathematics courses have increased my interest in mathematics

B: My college mathematics courses have decreased my interest in mathematics

No Opinion ☐

18. Compared with my classmates in UICSM classes, I feel that my real ability was

☐ higher than most ☐ the same as most ☐ lower than most ☐ I don't know

19. Check each group of students to whom you feel UICSM courses should be taught

☐ high ability ☐ average ability ☐ low ability ☐ no one

Appendix C

UICSM College Student Follow-up Study — Spring, 1964

Part 1

1st Year Follow-up of 1963 Graduates

UICSM College Student Follow-up Study -- Spring, 1964
Part I

1. Name _____ (Last / First / Middle)

2. Date of Birth _____ (Month / Day / Year)

3. High School graduated from

_____ (City / State)

4. Sex ☐ Male ☐ Female

_____ (Date of graduation)

5. High School Mathematics Courses _____ semesters of UICSM courses _____ semesters of other courses

5a. If you took courses OTHER THAN UICSM please list them.

	no. of semesters 1	2	3	4

6. High School grades -- Place an "X" on the scales below to indicate your averages.

Overall average

F D C B A

Mathematics average

F D C B A

7. Colleges and Universities attended | City | State | Dates of attendance

8. Number of terms completed at the end of the present term

_____ Semesters _____ Quarters _____ Trimesters _____ Summer Sessions

9. I am going to school ☐ full-time ☐ half-time ☐ less than half-time

10. Major Field _____

11. Are you likely to change your mind about this major?
☐ very likely ☐ likely ☐ unlikely ☐ very unlikely

12. What occupation do you plan as a career? _____

13. Are you likely to attend graduate or professional school?
☐ very likely ☐ likely ☐ unlikely ☐ very unlikely

14. College Mathematics Courses
Complete the table below for each course you have taken or are now taking.

Course	Text-Author	Terms when studied	Year	Reason for taking course	Grade

15. College grades -- Place an "X" on the scale below to indicate your overall college average.

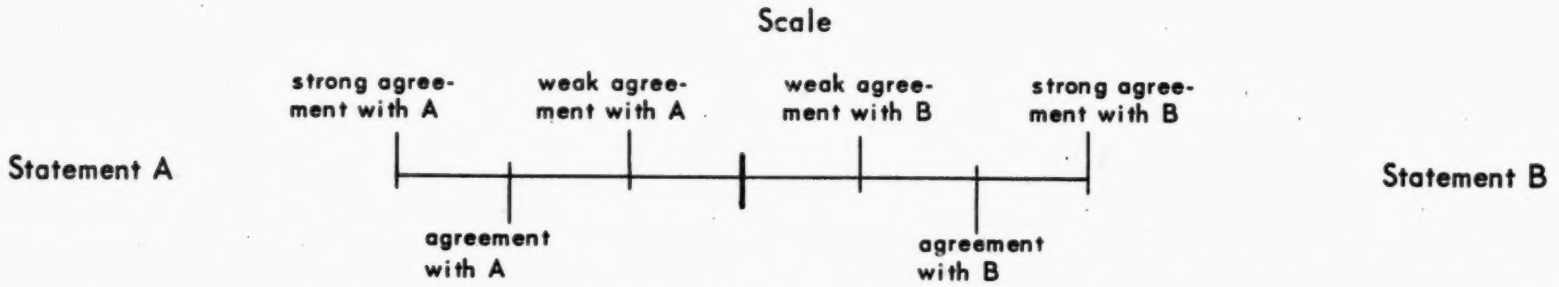
F D C B A

Inventory

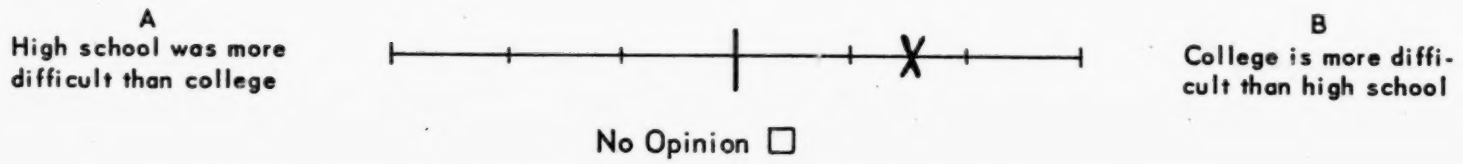
The following statements were designed so that you can indicate what your personal opinions are about UICSM mathematics training and your present college mathematics training.

For each pair of statements A and B, place an "X" mark on the scale between them to show the relative strength of your agreement with statement A or statement B. Mark the middle of the scale if your feelings lie equally between the two statements.

If neither statement applies to you, please check the box marked 'no opinion'.

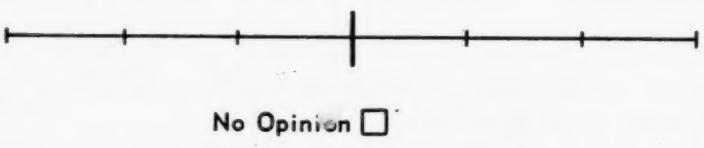


Example:

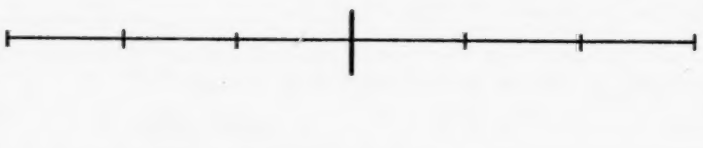


In this example, the student has indicated that he is in between weak agreement and agreement with Statement B.

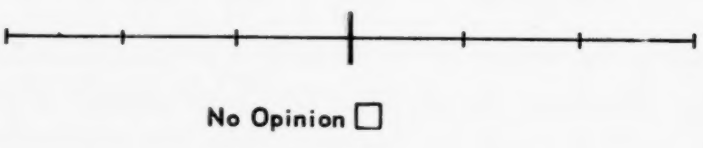
1. A: My UICSM courses stifled my interest in mathematics — B: My UICSM courses stimulated my interest in mathematics



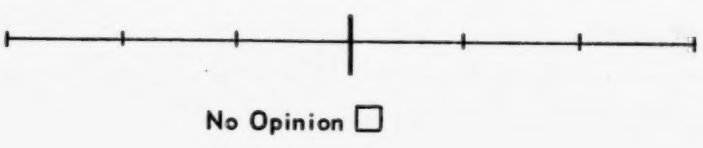
2. A: My UICSM mathematics background contributed toward my selection of a major in mathematics or a strong math-related field — B: My UICSM mathematics background contributed toward my avoidance of a major in mathematics or a strong math-related field



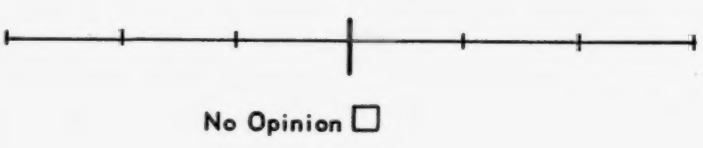
3. A: My UICSM teachers explained the concepts very well — B: My UICSM teachers explained the concepts very poorly

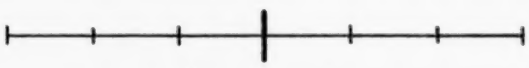
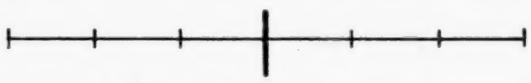
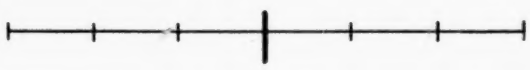
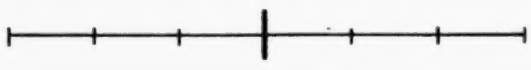
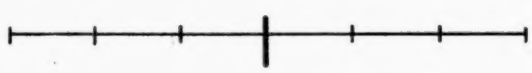


4. A: My UICSM teachers made mathematics dull for me — B: My UICSM teachers made mathematics interesting to me



5. A: There should be more drill work in the UICSM courses — B: There should be less drill work in the UICSM courses



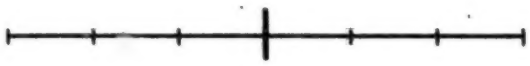
A 6. There should be more practical application in the UICSM courses	 No Opinion ☐	B There should be less practical application in the UICSM courses
A 7. UICSM classes should be grouped according to math ability -- that is, high-ability students in one class, average-ability in another, and so forth	 No Opinion ☐	B UICSM classes should have students of different ability levels together in one class
A 8. The way my UICSM classes were grouped was detrimental to me	 No Opinion ☐	B The way my UICSM classes were grouped was NOT detrimental to me
A 9. My UICSM courses prepared me for my college math courses	 No Opinion ☐	B My UICSM courses did not prepare me for my college math courses
A 10. My UICSM training has helped me in my non-math content courses in college	 No Opinion ☐	B My UICSM training has not helped me in my non-math content courses in college
A 11. I would have received a better mathematics background in a traditional mathematics program	 No Opinion ☐	B My UICSM mathematics background is better than I could have received in a traditional mathematics program
A 12. I am behind other students in college because of my UICSM background	 No Opinion ☐	B I have an advantage over other students in college because of my UICSM background
A 13. My college mathematics courses are less difficult than my UICSM courses	 No Opinion ☐	B My college mathematics courses are more difficult than my UICSM courses
A 14. There is more emphasis on theory and understanding in my college math courses than there was in my UICSM courses	 No Opinion ☐	B There was more emphasis on theory and understanding in my UICSM courses than in my college math courses

15. A: There should be less emphasis on theory and understanding in my college math courses

B: There should be more emphasis on theory and understanding in my college math courses

No Opinion ☐

16. A: My college math courses are mainly courses in memorizing and applying rules and formulas



B: My college math courses are mainly courses in learning and understanding mathematical concepts

No Opinion ☐

17. A: My college mathematics courses have increased my interest in mathematics

B: My college mathematics courses have decreased my interest in mathematics

No Opinion ☐

18. Compared with my classmates in UICSM classes, I feel that my real ability was

☐ higher than most ☐ the same as most ☐ lower than most ☐ I don't know

19. Check each group of students to whom you feel UICSM courses should be taught

☐ *high ability* ☐ *average ability* ☐ *low ability* ☐ *no one*

20. Please indicate anything about your UICSM courses which you especially liked or disliked, and tell why you liked or disliked it.

Appendix D

Colleges attended by five or more UICSM students in the 1962 and 1963 samples and the distribution of the total sample among the states.

Colleges attended by five or more UICSM students

in the 1962 and 1963 samples.*

State	No. of students		Institution
	1962	1963	
Arizona	5	20	University of Arizona
California		5	University of California, Berkeley
	10		Stanford University
Colorado		5	University of Colorado
		5	University of Denver
Connecticut		12	University of Connecticut
		5	Wesleyan University
Hawaii		86	University of Hawaii
Illinois	33	64	University of Illinois
	8	25	Northern Illinois University
		13	Illinois State Normal University
		12	Northwestern University
		9	Western Illinois University
		7	Principia College
		5	Elmhurst College
		5	Knox College
		5	Monmouth College
Indiana	14	24	Purdue University
		6	Indiana University
	7	6	Wabash College
		5	De Pauw University
Iowa		9	Iowa State University
Maine		5	Colby College
Massachusetts	8	14	University of Massachusetts
		10	Boston University
		9	Amherst College
		9	Northeastern University
		7	Wellesley College
		7	Tafts University
	6	6	Harvard University

* 1962 and 1963 refer to the years of graduation from high school.

State	No. of students		Institution
	1962	1963	
Massachusetts (continued)		5	Brandeis University
	7		Massachusetts Institute of Technology
Michigan	6	32	University of Michigan
		27	Wayne State University
	8	16	Michigan State University
		5	Michigan State, Oakland
		5	Highland Park College
Minnesota		9	University of Minnesota
Missouri		7	University of Missouri
New Hampshire	6		Dartmouth College
New Jersey		14	Rutgers University
		8	Princeton University
		7	Fairleigh-Dickinson University
		6	Douglass College
Ohio		17	Miami University
		9	University of Cincinnati
		6	Ohio University
		5	Oberlin College
Pennsylvania	18	19	Duquesne University
		13	Vella Maria College
	5	13	Penn State University
		9	University of Pittsburgh
		8	Seton Hall College
		7	Carnegie Institute of Technology
		6	University of Pennsylvania
		5	St. Francis College
Rhode Island		5	Pembroke College
Vermont		6	University of Vermont
Wisconsin	9	8	University of Wisconsin
		5	Beloit College
	144	682	

The Distribution of Colleges Attended by UICSM 1963 Graduates Who Returned the April 1964 Follow-up Questionaires.

261 Colleges in 38 States, Canada, and Belgium

Appendix E

The high schools which had 1963 graduates who participated in the 1964 follow-up of UICSM students.

Appendix E. The high schools which had 1963 graduates who participated in the 1964 follow-up of UICSM students.

Arizona	
Catalina High School	Tucson
Pueblo High School	Tucson
California	
Desert Sun High School	Idyllwild
W. C. Crawford High School	San Diego
Colorado	
Colorado Academy	Denver
Connecticut	
E. O. Smith High School	Storrs
Florida	
Melbourne High School	Melbourne
Hawaii	
Kapaa High School	Kapaa
Kauai High School	Lihue, Kauai
University of Hawaii High School	Honolulu
Kaimuki High School	Honolulu
Waianae High School	Waianae, Oahu
J. B. Castle High School	Kaneoke, Oahu
Kalani High School	Honolulu
Illinois	
Warren Township High School	Gurnee
University of Illinois High School	Urbana

Illinois	
Pekin High School	Pekin
Dwight D. Eisenhower High School	Blue Island
York High School	Elmhurst
Willowbrook High School	Villa Park
Barrington High School	Barrington
G. E. Thompson High School	St. Charles
Indiana	
Hammond High School	Hammond
Crispus Attuck High School	Indianapolis
Elkhart High School	Elkhart
Massachusetts	
Beaver Country Day School	Chestnut Hill
Mount Everett High School	Sheffield
Newton South High School	Newton Centre
Newton High School	Newtonville
Michigan	
Oak Park High School	Oak Park
Ferndale High School	Ferndale
Minnesota	
Owatonna High School	Owatonna
St. Paul Academy	St. Paul
Missouri	
North Kansas City High School	North Kansas City
Principia High School	St. Louis
St. Louis Prep Seminary	St. Louis

New Jersey	
A. L. Johnson High School	Clark
Hackensack High School	Hackensack
North Plainfield High School	North Plainfield
Pascack Valley High School	Hillsdale
Ohio	
Mariemont High School	Cincinnati
Talawanda High School	Oxford
Oklahoma	
University of Oklahoma High School	Norman
Oregon	
Franklin High School	Portland
Pennsylvania	
Cheltenham High School	Wyncote
Council Rock High School	Newton, Books County
St. Casimer High School	Pittsburgh
St. George High School	Pittsburgh
Villa Maria Academy	Erie
Altoona Catholic High School	Altoona
Sacred Heart High School	Pittsburgh
St. Basil High School	Pittsburgh
St. Benedict High School	Pittsburgh
West Virginia	
Kingwood High School	Kingwood

The Distribution of High Schools Whose 1963 Graduates Participated in the 1964 Follow-up Study of UICSM Students.

54 High Schools in 18 States

Appendix F

The combined distribution of respondents and nonrespondents in a questionnaire survey of UICSM 1962 and 1963 high school graduates.

The combined distribution of respondents and nonrespondents in a questionnaire survey of UICSM students; 1141 1963 graduates, and 400 1962 graduates.*

State or Country of College Study	No. of Students		No. of Colleges	
	1962	1963	1962	1963
Alabama				
Alaska				
Arizona	6	22	2	2
Arkansas				
California	15	34	6	18
Colorado	1	19	1	8
Connecticut	11	26	3	7
Delaware	2	2	1	1
Florida	2	9	2	5
Georgia		4		3
Hawaii	4	89	1	4
Idaho				
Illinois	63	181	17	25
Indiana	39	66	11	17
Iowa	10	24	6	8
Kansas	1	10	1	5
Kentucky		4		3
Louisiana	2		2	
Maine	10	8	4	4
Maryland	2	6	2	3
Massachusetts	46	97	15	21
Michigan	16	110	4	17
Minnesota	4	16	3	6
Mississippi				
Missouri	3	25	3	11
Montana				
Nebraska				
Nevada				

*Of the 1141 students, 728 responded to the questionnaire; the 400 total for the 1962 graduates is comprised only of respondents.

State or Country of College Study	No. of Students		No. of Colleges	
	1962	1963	1962	1963
New Hampshire	7	6	2	2
New Jersey	13	46	7	11
New Mexico	1	1	1	1
New York	18	27	15	18
North Carolina	1	6	1	3
North Dakota				
Ohio	13	63	9	21
Oklahoma		3		1
Oregon	12	11	6	7
Pennsylvania	63	138	25	37
Rhode Island	3	11	2	4
South Carolina	1	1	1	1
South Dakota				
Tennessee		3		2
Texas	1	5	1	4
Utah	1	4	1	2
Vermont	7	13	4	5
Virginia	2	6	1	5
Washington	4	8	2	7
West Virginia	2	3	1	2
Wisconsin	12	25	3	9
Wyoming				
Washington, D.C.	2	7	2	4
Belgium	1	1		1
Canada		1		1
	400	1141	168	316

The 1141 1963 graduates were distributed among 38 states, the District of Columbia, Belgium, and Canada in 316 institutions of higher learning.

The 400 1962 graduates were distributed among 36 states and the District of Columbia, in 160 colleges and universities.